09/475945

Fig. 1

101

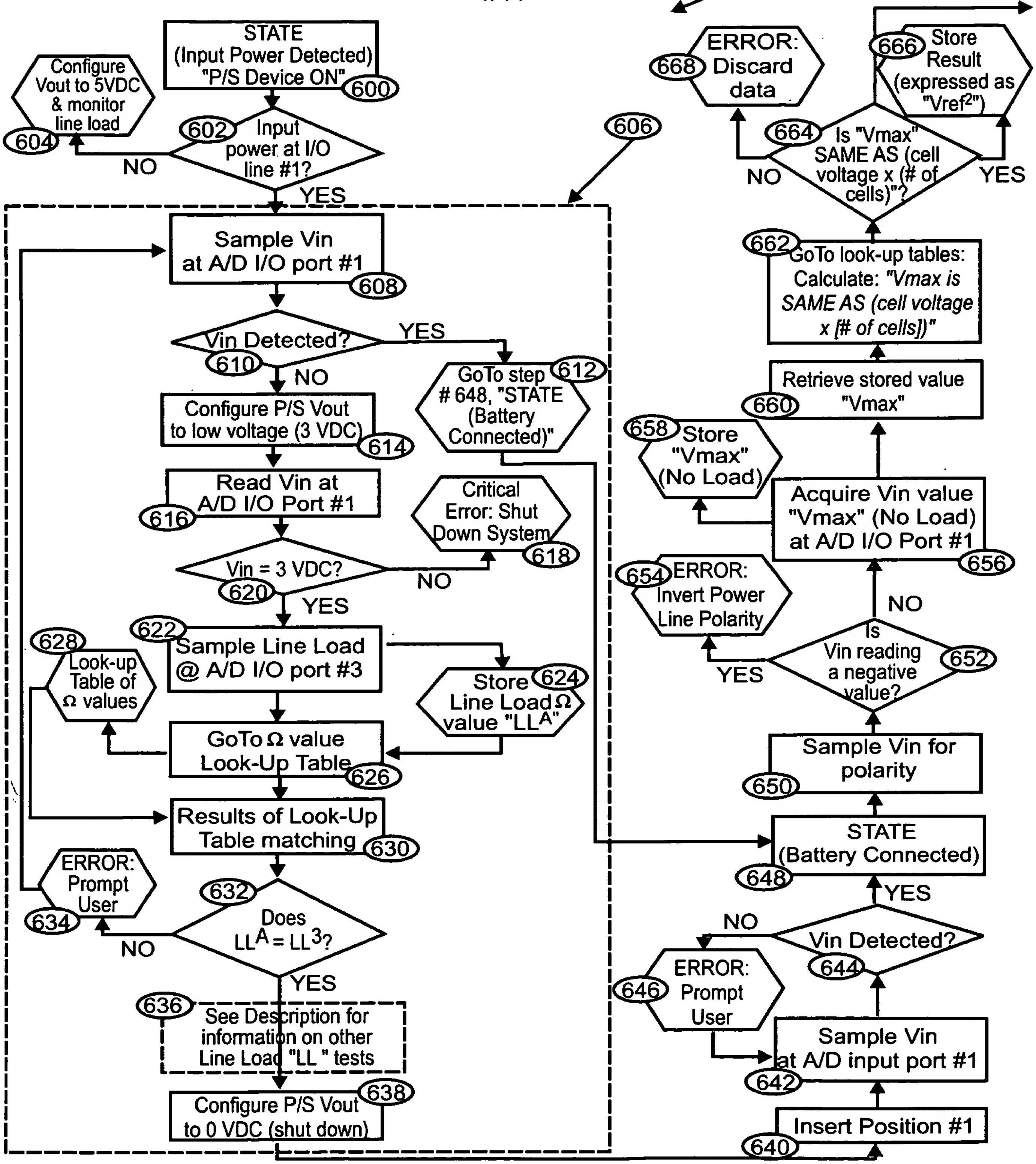
STATE (Input Power Detected) "P/S Device ON" 600
Configure Vout to 5VDC & monitor line load 604
602 Input power at I/O line #1?
NO
YES
606
Sample Vin at A/D I/O port #1 608
Vin Detected? 610
YES
NO
GoTo step # 648, "STATE (Battery Connected)" 612
Configure P/S Vout to low voltage (3 VDC) 614
Read Vin at A/D I/O Port #1 616
Critical Error: Shut Down System 618
Vin = 3 VDC? 620
NO
YES
622 Sample Line Load @ A/D I/O port #3
Store Line Load Ω value "LLA" 624
628 Look-up Table of Ω values
GoTo Ω value Look-Up Table 626
Results of Look-Up Table matching 630
ERROR: Prompt User 634
632 Does LLA = LL3?
NO
YES
636 See Description for information on other Line Load "LL" tests
Configure P/S Vout to 0 VDC (shut down) 638
ERROR: Discard data 668
666 Store Result (expressed as "Vref2")
664 Is "Vmax" SAME AS (cell voltage x (# of cells)"?
NO
YES
662 GoTo look-up tables: Calculate: "Vmax is SAME AS (cell voltage x [# of cells])"
Retrieve stored value "Vmax" 660
658 Store "Vmax" (No Load)
Acquire Vin value "Vmax" (No Load) at A/D I/O Port #1 656
654 ERROR: Invert Power Line Polarity
NO
Is Vin reading a negative value? 652
YES
Sample Vin for polarity 650
STATE (Battery Connected) 648
YES
NO
Vin Detected? 644
646 ERROR: Prompt User
Sample Vin at A/D input port #1 642
Insert Position #1 640

Fig. 1

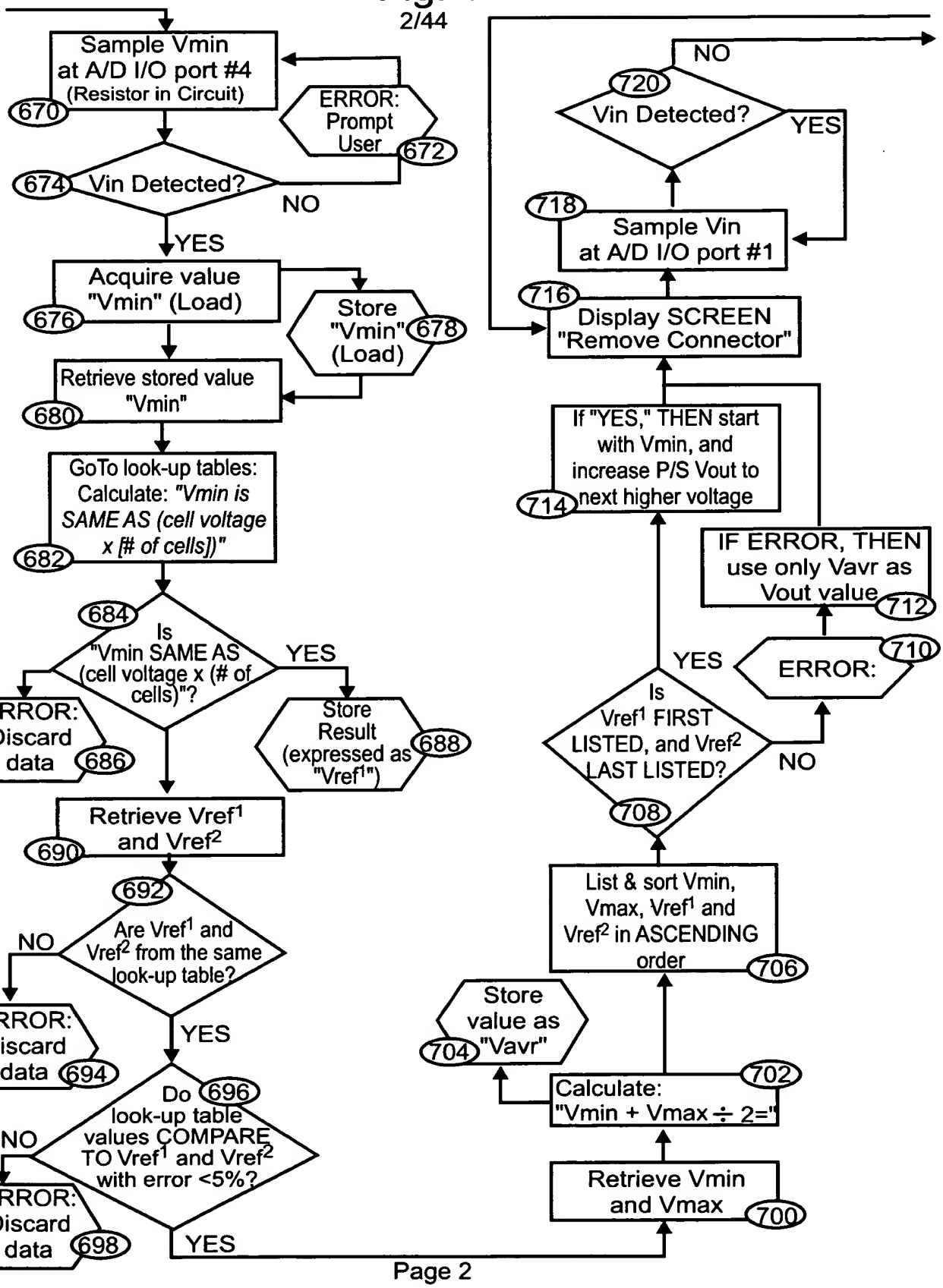
Sample Vmin at A/D I/O port #4 (Resistor in Circuit)
670
ERROR: Prompt User
672
674
Vin Detected?
NO
YES
Acquire value "Vmin" (Load)
676
Store "Vmin" (Load)
678
Retrieve stored value "Vmin"
680
GoTo look-up tables: Calculate: "Vmin is SAME AS (cell voltage x [# of cells])"
682
684
Is "Vmin SAME AS (cell voltage x (# of cells)"?
YES
ERROR: Discard data
686
Store Result (expressed as "Vref1")
688
Retrieve Vref1 and Vref2
690
692
Are Vref1 and Vref2 from the same look-up table?
NO
YES
ERROR: Discard data
694
Do look-up table values COMPARE TO Vref1 and Vref2 with error <5%?
696
NO
ERROR: Discard data
698
YES
Retrieve Vmin and Vmax
700
Calculate: "Vmin + Vmax ÷ 2="
702
Store value as "Vavr"
704
List & sort Vmin, Vmax, Vref1 and Vref2 in ASCENDING order
706
Is Vref1 FIRST LISTED, and Vref2 LAST LISTED?
708
YES
NO
ERROR:
710
IF ERROR, THEN use only Vavr as Vout value
712
If "YES," THEN start with Vmin, and increase P/S Vout to next higher voltage
714
Display SCREEN "Remove Connector"
716
Sample Vin at A/D I/O port #1
718
Vin Detected?
720
NO
YES

Fig. 1

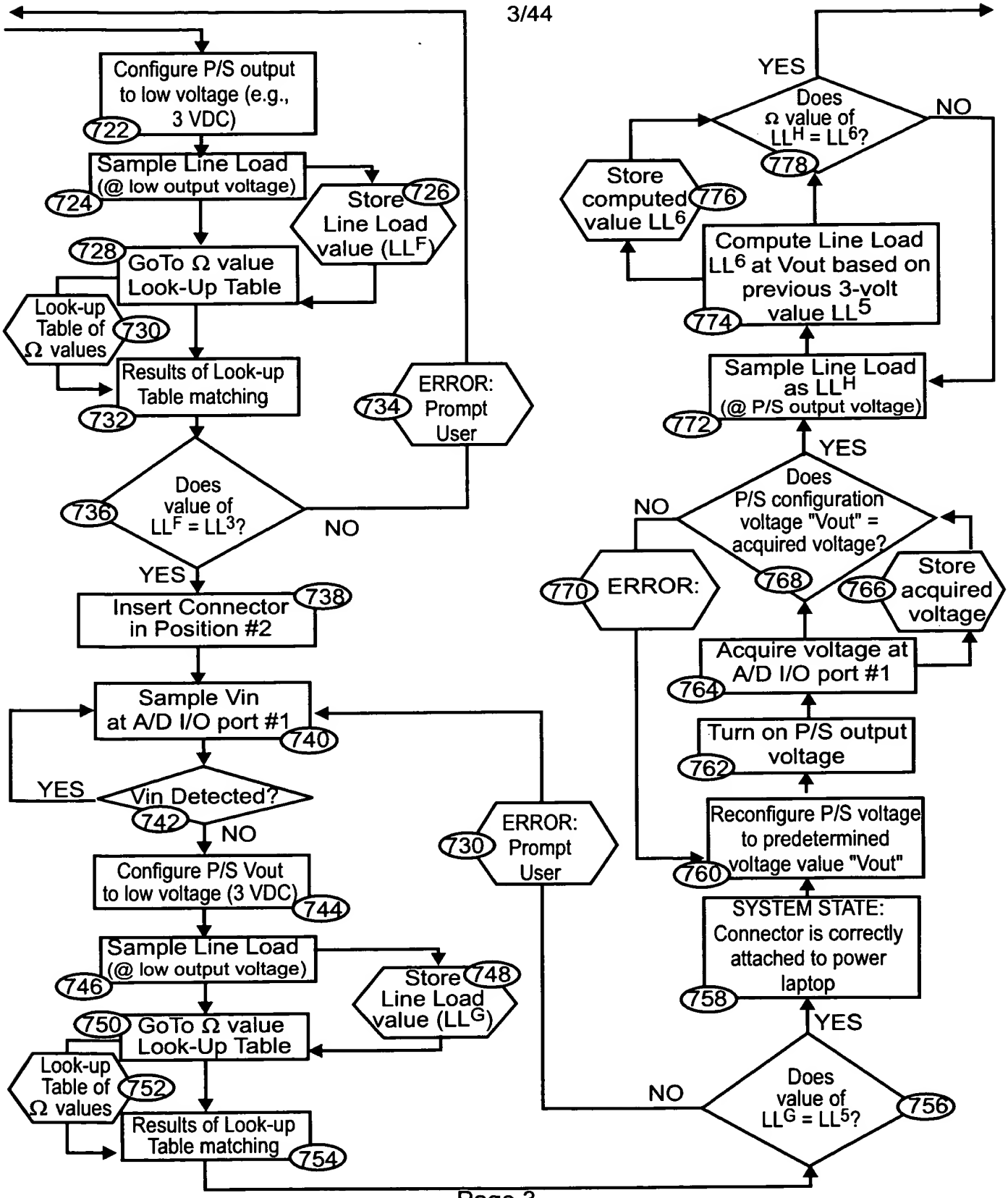
Configure P/S output to low voltage (e.g., 3 VDC)
722
Sample Line Load (@ low output voltage)
724
Store Line Load value (LL^F)
726
GoTo Ω value Look-Up Table
728
Look-up Table of Ω values
730
Results of Look-up Table matching
732
ERROR: Prompt User
734
Does value of LL^F = LL^3?
736
NO
YES
Insert Connector in Position #2
738
Sample Vin at A/D I/O port #1
740
YES
Vin Detected?
742
NO
Configure P/S Vout to low voltage (3 VDC)
744
Sample Line Load (@ low output voltage)
746
Store Line Load value (LL^G)
748
GoTo Ω value Look-Up Table
750
Look-up Table of Ω values
752
Results of Look-up Table matching
754
ERROR: Prompt User
730
Does value of LL^G = LL^5?
756
NO
YES
SYSTEM STATE: Connector is correctly attached to power laptop
758
Reconfigure P/S voltage to predetermined voltage value "Vout"
760
Turn on P/S output voltage
762
Acquire voltage at A/D I/O port #1
764
Store acquired voltage
766
Does P/S configuration voltage "Vout" = acquired voltage?
768
NO
ERROR:
770
YES
Sample Line Load as LL^H (@ P/S output voltage)
772
Compute Line Load LL^6 at Vout based on previous 3-volt value LL^5
774
Store computed value LL^6
776
Does Ω value of LL^H = LL^6?
778
NO
YES

Fig. 1

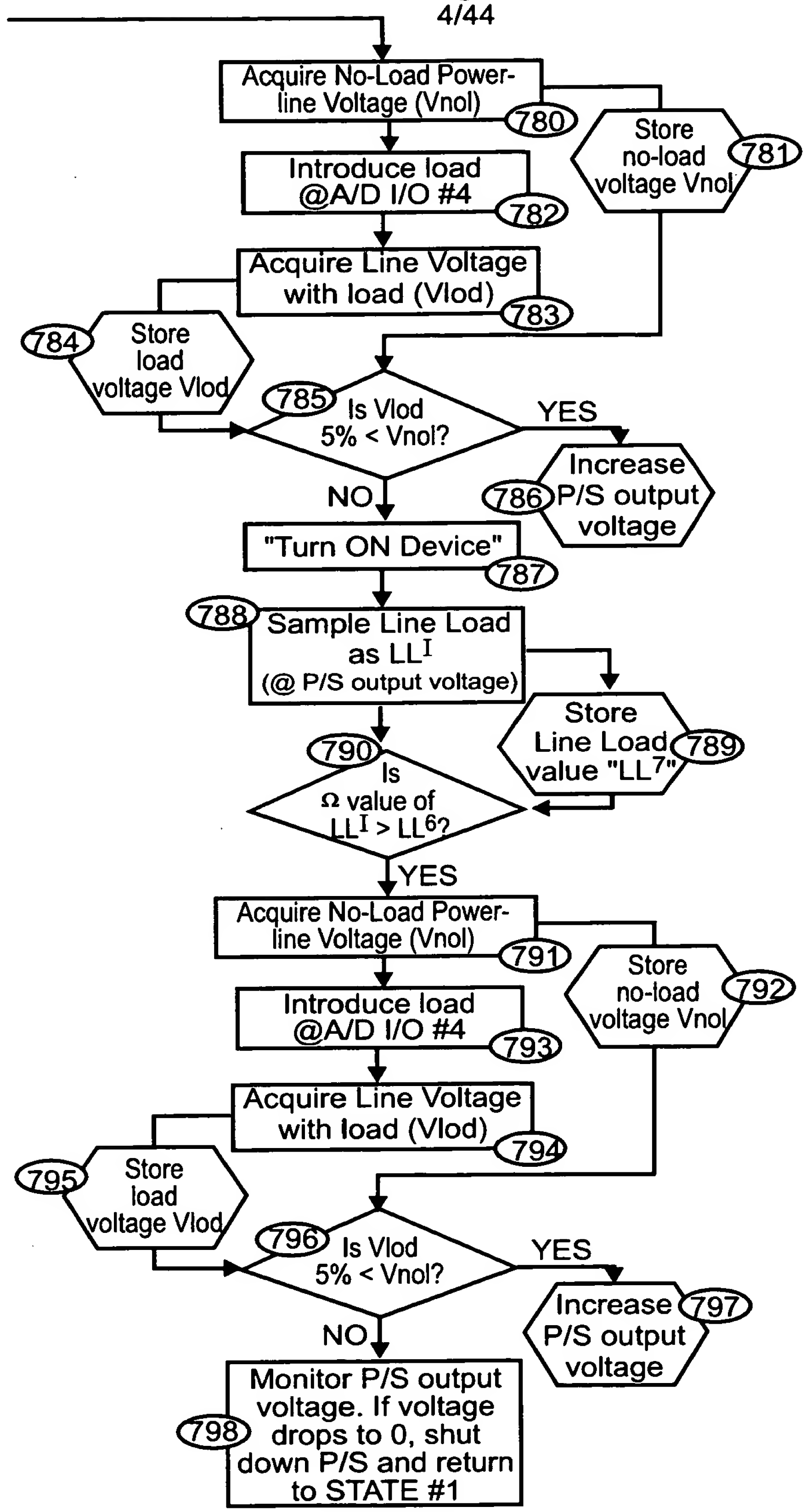
Acquire No-Load Power-line Voltage (Vnol)
780
Store no-load voltage Vnol
781
Introduce load @A/D I/O #4
782
Acquire Line Voltage with load (Vlod)
783
Store load voltage Vlod
784
Is Vlod 5% < Vnol?
785
YES
Increase P/S output voltage
786
NO
"Turn ON Device"
787
Sample Line Load as LLI (@ P/S output voltage)
788
Store Line Load value "LL7"
789
Is Ω value of LLI > LL6?
790
YES
Acquire No-Load Power-line Voltage (Vnol)
791
Store no-load voltage Vnol
792
Introduce load @A/D I/O #4
793
Acquire Line Voltage with load (Vlod)
794
Store load voltage Vlod
795
Is Vlod 5% < Vnol?
796
YES
Increase P/S output voltage
797
NO
Monitor P/S output voltage. If voltage drops to 0, shut down P/S and return to STATE #1
798

Fig. 1A

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Software for In-line Corded Device

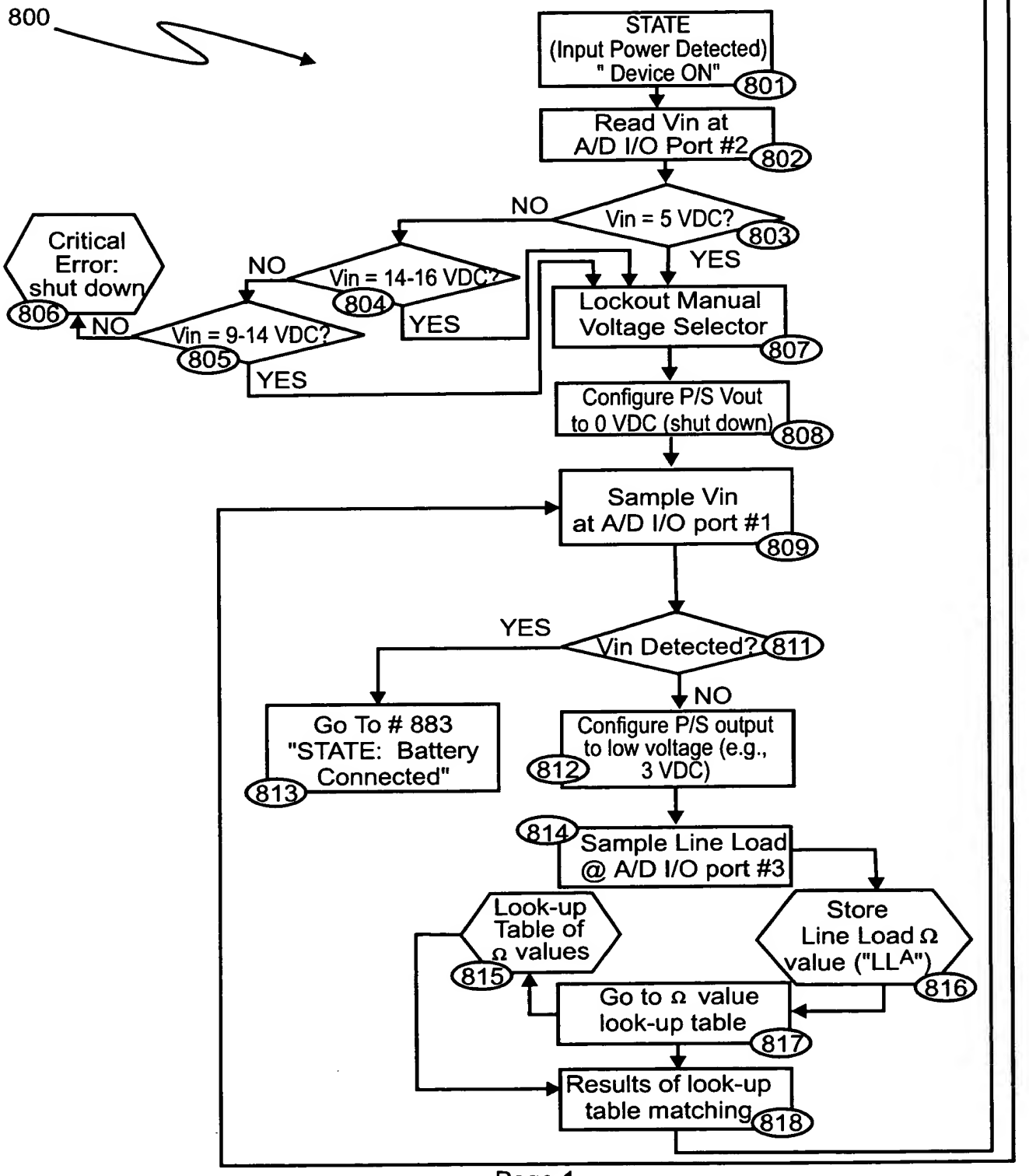

Fig. 1A

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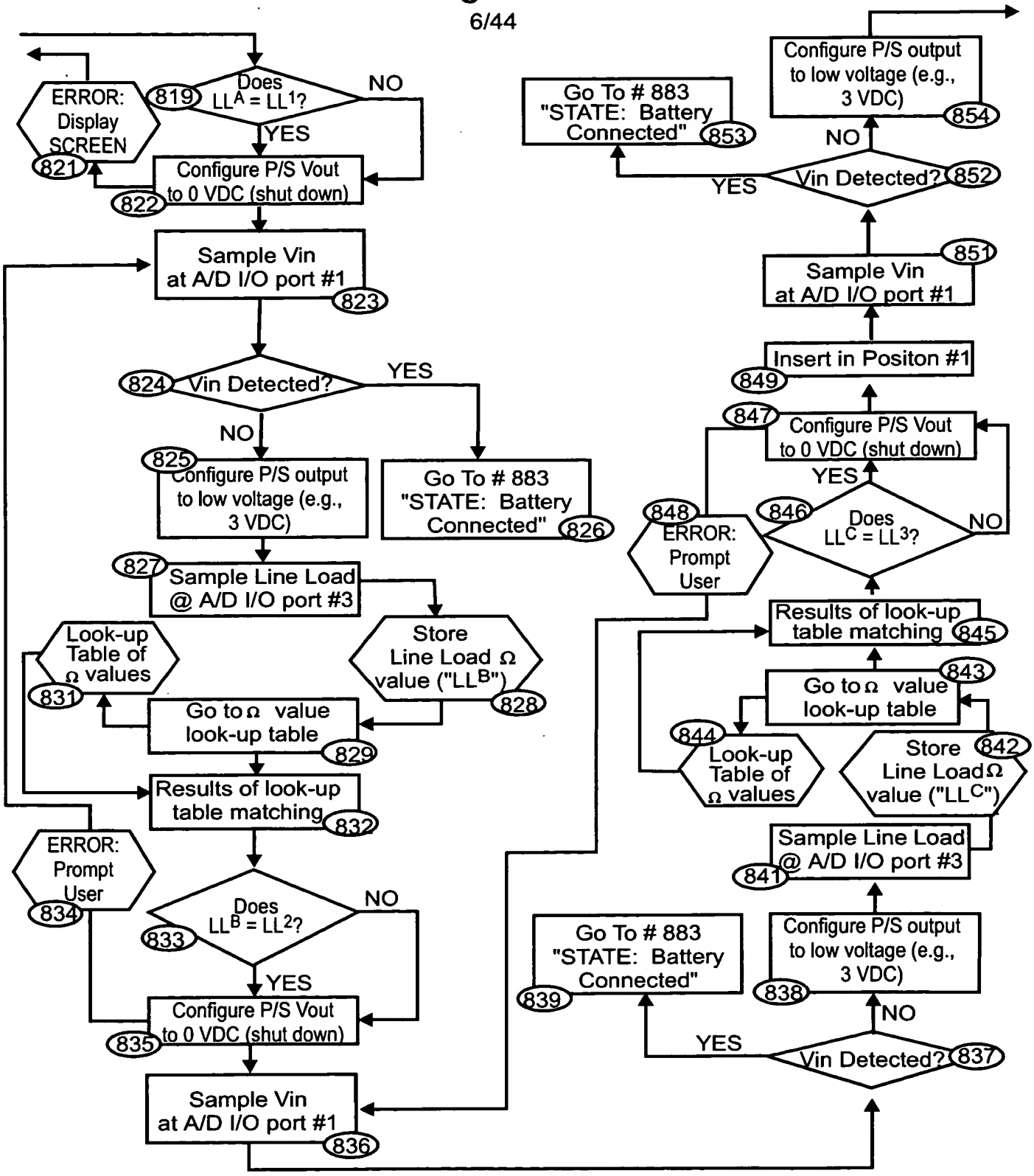
ERROR: Display SCREEN
821
Does LL^A = LL^1?
819
NO
YES
Configure P/S Vout to 0 VDC (shut down)
822
Sample Vin at A/D I/O port #1
823
Vin Detected?
824
YES
NO
Configure P/S output to low voltage (e.g., 3 VDC)
825
Go To # 883 "STATE: Battery Connected"
826
Sample Line Load @ A/D I/O port #3
827
Look-up Table of Ω values
831
Store Line Load Ω value ("LL^B")
828
Go to Ω value look-up table
829
Results of look-up table matching
832
ERROR: Prompt User
834
Does LL^B = LL^2?
833
NO
YES
Configure P/S Vout to 0 VDC (shut down)
835
Sample Vin at A/D I/O port #1
836
Go To # 883 "STATE: Battery Connected"
853
Configure P/S output to low voltage (e.g., 3 VDC)
854
NO
Vin Detected?
852
YES
Sample Vin at A/D I/O port #1
851
Insert in Positon #1
849
Configure P/S Vout to 0 VDC (shut down)
847
YES
ERROR: Prompt User
848
Does LL^C = LL^3?
846
NO
Results of look-up table matching
845
Go to Ω value look-up table
843
Look-up Table of Ω values
844
Store Line Load Ω value ("LL^C")
842
Sample Line Load @ A/D I/O port #3
841
Go To # 883 "STATE: Battery Connected"
839
Configure P/S output to low voltage (e.g., 3 VDC)
838
NO
YES
Vin Detected?
837

Fig. 1A

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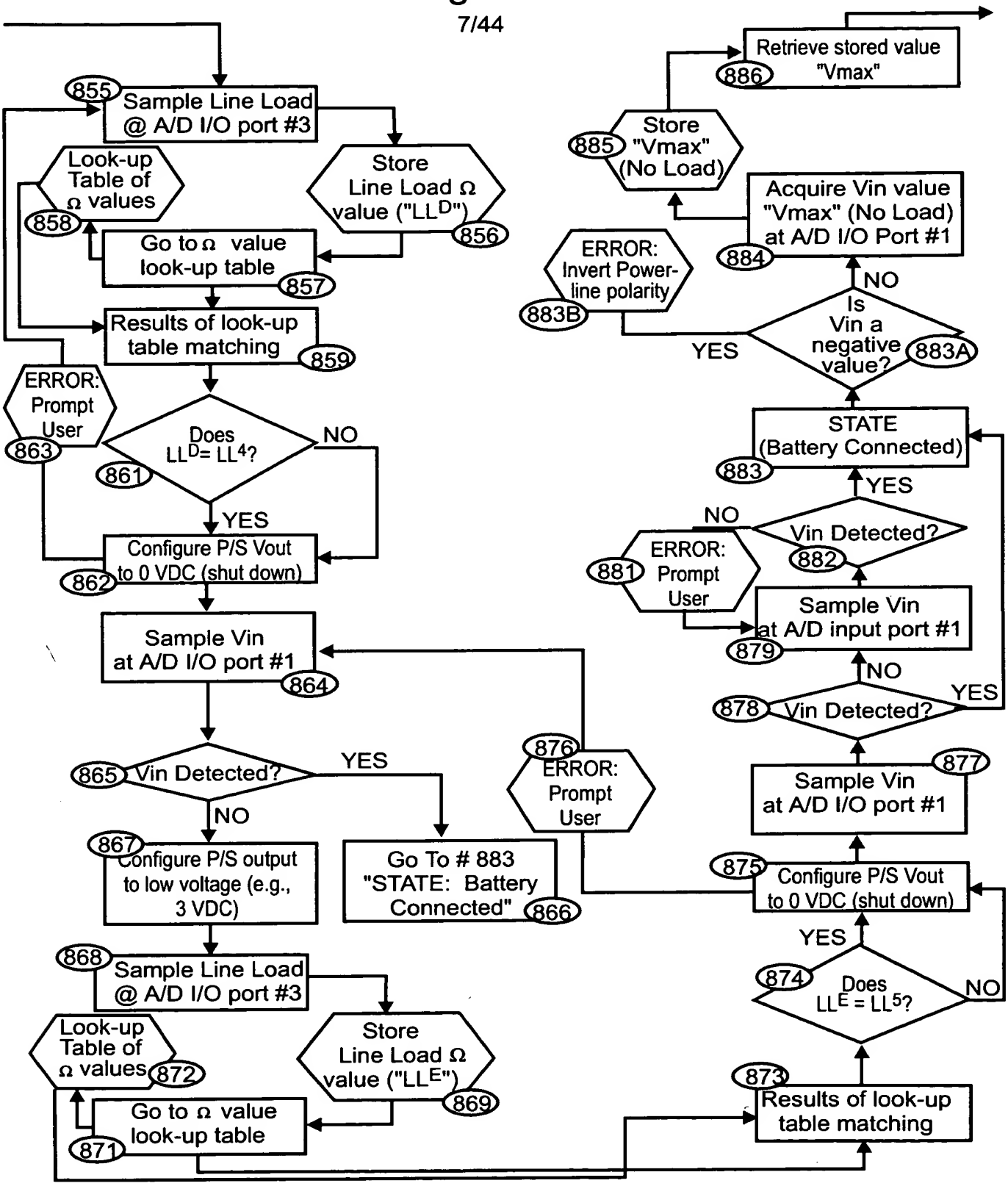
855
Sample Line Load @ A/D I/O port #3
Look-up Table of Ω values
858
Store Line Load Ω value ("LL^D")
856
Go to Ω value look-up table
857
Results of look-up table matching
859
ERROR: Prompt User
863
Does LL^D= LL^4?
861
NO
YES
Configure P/S Vout to 0 VDC (shut down)
862
Sample Vin at A/D I/O port #1
864
Vin Detected?
865
YES
NO
Configure P/S output to low voltage (e.g., 3 VDC)
867
Go To # 883 "STATE: Battery Connected"
866
876
ERROR: Prompt User
Sample Line Load @ A/D I/O port #3
868
Look-up Table of Ω values
872
Store Line Load Ω value ("LL^E")
869
Go to Ω value look-up table
871
Retrieve stored value "Vmax"
886
Store "Vmax" (No Load)
885
Acquire Vin value "Vmax" (No Load) at A/D I/O Port #1
884
ERROR: Invert Power-line polarity
883B
Is Vin a negative value?
883A
NO
YES
STATE (Battery Connected)
883
YES
Vin Detected?
882
NO
ERROR: Prompt User
881
Sample Vin at A/D input port #1
879
NO
Vin Detected?
878
YES
Sample Vin at A/D I/O port #1
877
Configure P/S Vout to 0 VDC (shut down)
875
YES
Does LL^E = LL^5?
874
NO
Results of look-up table matching
873

Fig. 1A

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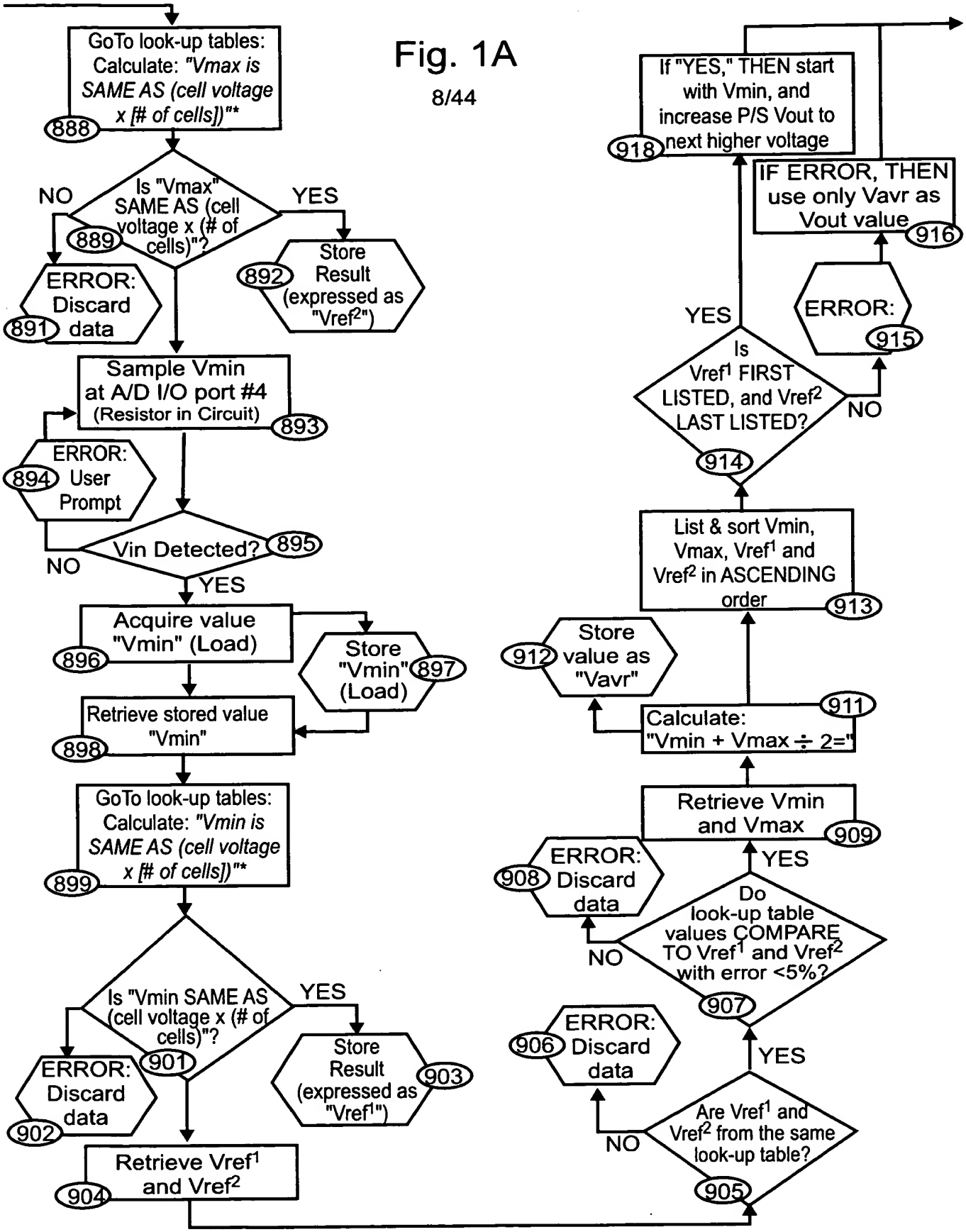
GoTo look-up tables: Calculate: "Vmax is SAME AS (cell voltage x [# of cells])"*
888
Is "Vmax" SAME AS (cell voltage x (# of cells)"?
889
NO
YES
ERROR: Discard data
891
Store Result (expressed as "Vref2")
892
Sample Vmin at A/D I/O port #4 (Resistor in Circuit)
893
ERROR: User Prompt
894
Vin Detected?
895
NO
YES
Acquire value "Vmin" (Load)
896
Store "Vmin" (Load)
897
Retrieve stored value "Vmin"
898
GoTo look-up tables: Calculate: "Vmin is SAME AS (cell voltage x [# of cells])"*
899
Is "Vmin SAME AS (cell voltage x (# of cells)"?
901
YES
ERROR: Discard data
902
Store Result (expressed as "Vref1")
903
Retrieve Vref1 and Vref2
904
Are Vref1 and Vref2 from the same look-up table?
905
NO
YES
ERROR: Discard data
906
Do look-up table values COMPARE TO Vref1 and Vref2 with error <5%?
907
NO
YES
ERROR: Discard data
908
Retrieve Vmin and Vmax
909
Calculate: "Vmin + Vmax ÷ 2="
911
Store value as "Vavr"
912
List & sort Vmin, Vmax, Vref1 and Vref2 in ASCENDING order
913
Is Vref1 FIRST LISTED, and Vref2 LAST LISTED?
914
NO
YES
ERROR:
915
IF ERROR, THEN use only Vavr as Vout value
916
If "YES," THEN start with Vmin, and increase P/S Vout to next higher voltage
918

Fig. 1A

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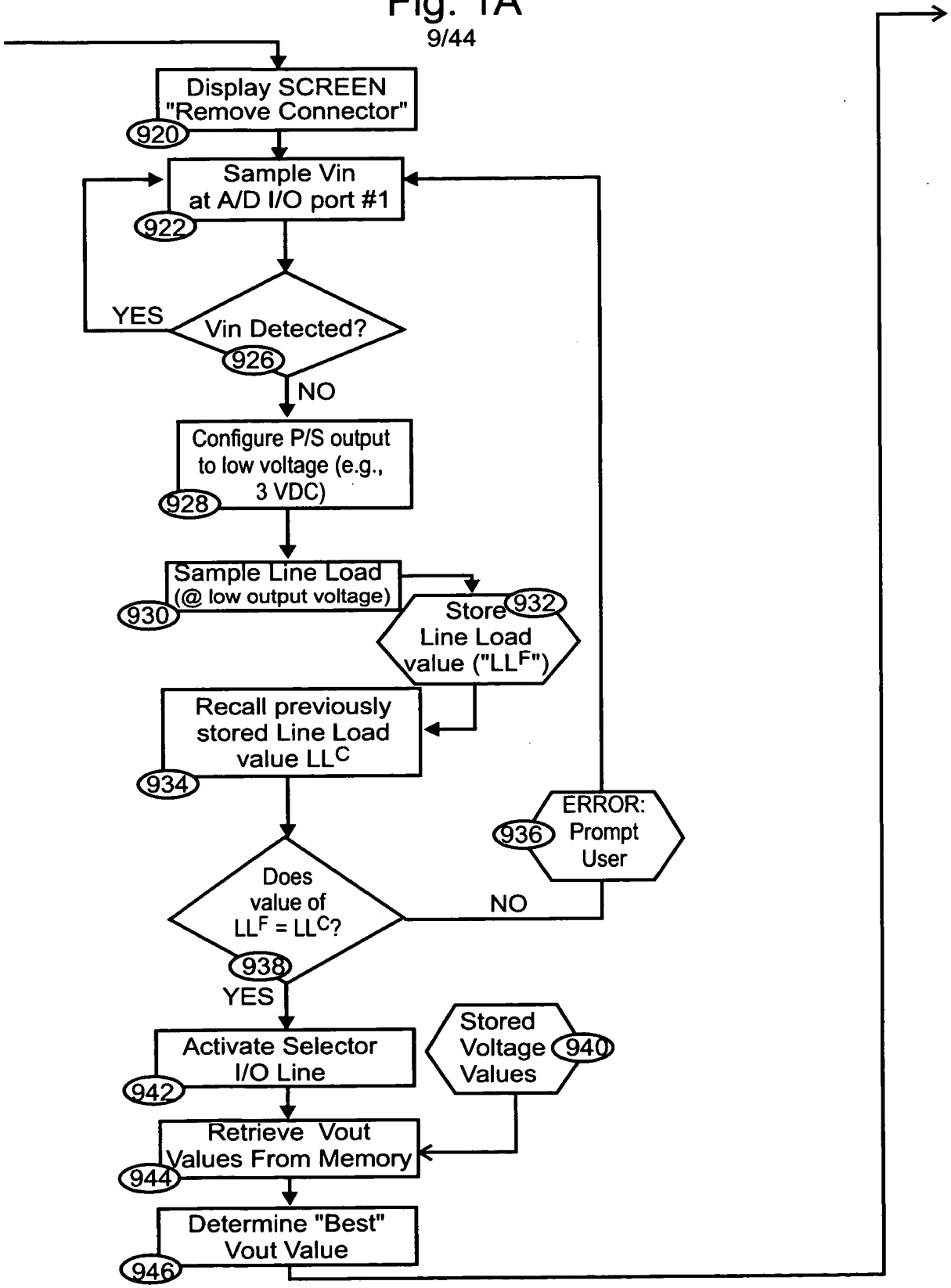
Display SCREEN "Remove Connector"
920
Sample Vin at A/D I/O port #1
922
YES
Vin Detected?
926
NO
Configure P/S output to low voltage (e.g., 3 VDC)
928
Sample Line Load (@ low output voltage)
930
Store Line Load value ("LL^F")
932
Recall previously stored Line Load value LL^C
934
ERROR: Prompt User
936
Does value of LL^F = LL^C?
938
NO
YES
Activate Selector I/O Line
942
Stored Voltage Values
940
Retrieve Vout Values From Memory
944
Determine "Best" Vout Value
946

Fig. 1A

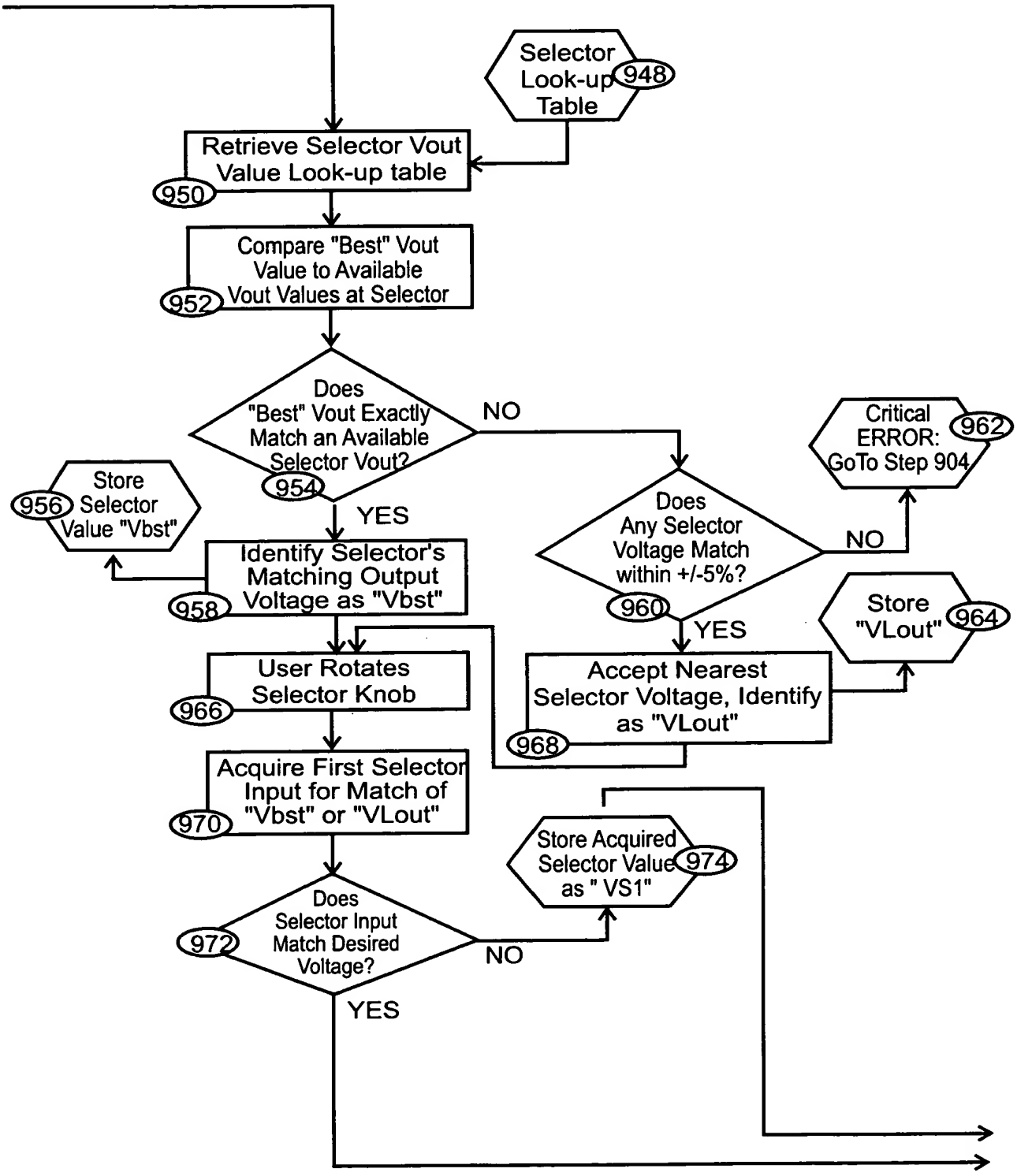
Selector Look-up Table 948
Retrieve Selector Vout Value Look-up table 950
Compare "Best" Vout Value to Available Vout Values at Selector 952
Does "Best" Vout Exactly Match an Available Selector Vout? 954
NO
YES
Critical ERROR: GoTo Step 904 962
Store Selector Value "Vbst" 956
Identify Selector's Matching Output Voltage as "Vbst" 958
Does Any Selector Voltage Match within +/-5%? 960
NO
YES
Store "VLout" 964
User Rotates Selector Knob 966
Accept Nearest Selector Voltage, Identify as "VLout" 968
Acquire First Selector Input for Match of "Vbst" or "VLout" 970
Store Acquired Selector Value as " VS1" 974
Does Selector Input Match Desired Voltage? 972
NO
YES

Fig. 1A

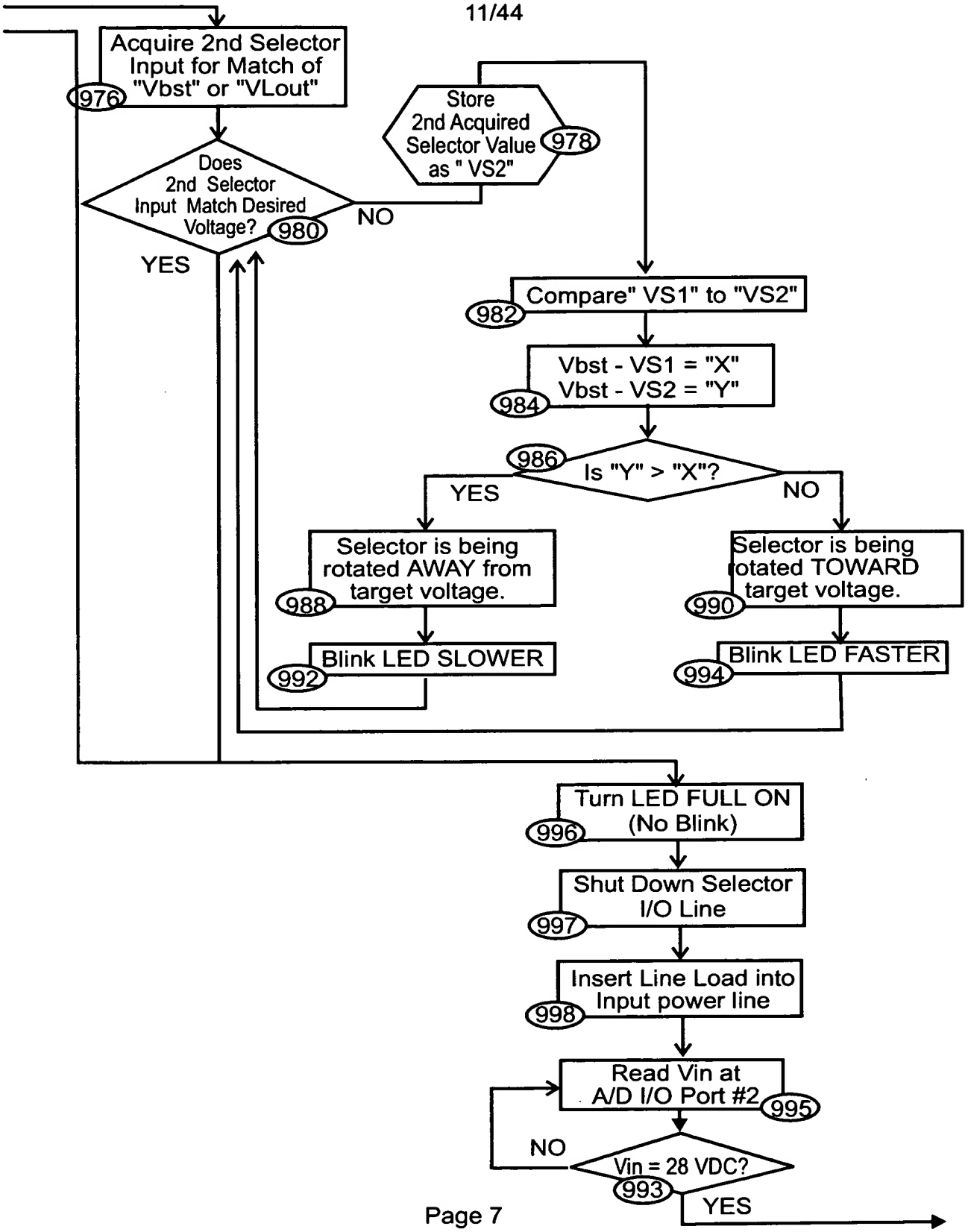
Acquire 2nd Selector Input for Match of "Vbst" or "VLout"
976
Store 2nd Acquired Selector Value as " VS2"
978
Does 2nd Selector Input Match Desired Voltage?
980
NO
YES
Compare" VS1" to "VS2"
982
Vbst - VS1 = "X"
Vbst - VS2 = "Y"
984
986
Is "Y" > "X"?
YES
NO
Selector is being rotated AWAY from target voltage.
988
Selector is being rotated TOWARD target voltage.
990
Blink LED SLOWER
992
Blink LED FASTER
994
Turn LED FULL ON (No Blink)
996
Shut Down Selector I/O Line
997
Insert Line Load into Input power line
998
Read Vin at A/D I/O Port #2
995
NO
Vin = 28 VDC?
993
YES

Fig. 1A

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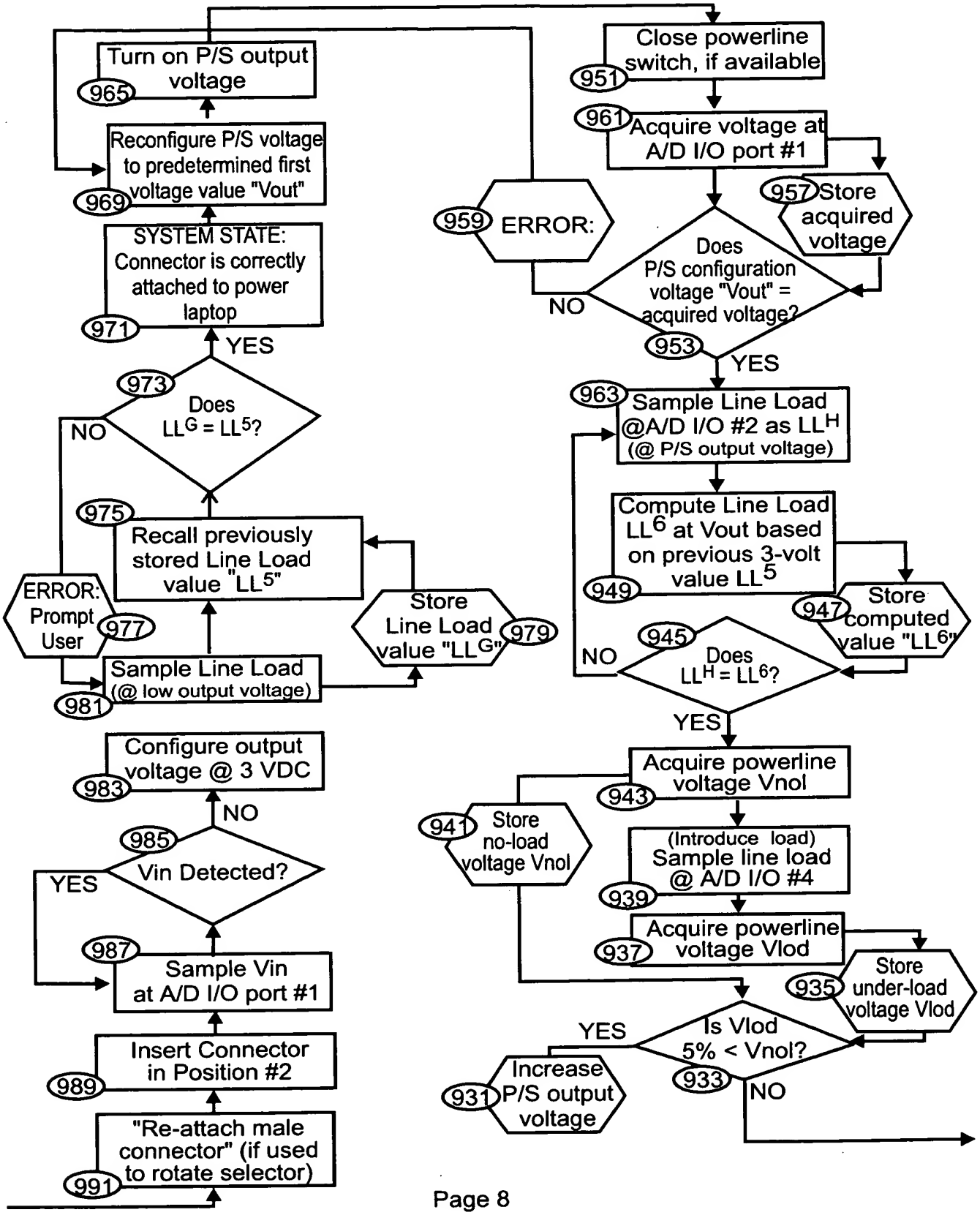
Close powerline switch, if available
951
Acquire voltage at A/D I/O port #1
961
Store acquired voltage
957
ERROR:
959
Does P/S configuration voltage "Vout" = acquired voltage?
NO
953
YES
Sample Line Load @A/D I/O #2 as LL^H (@ P/S output voltage)
963
Compute Line Load LL^6 at Vout based on previous 3-volt value LL^5
949
Store computed value "LL^6"
947
Does LL^H = LL^6?
945
NO
YES
Acquire powerline voltage Vnol
943
Store no-load voltage Vnol
941
(Introduce load) Sample line load @ A/D I/O #4
939
Acquire powerline voltage Vlod
937
Store under-load voltage Vlod
935
Is Vlod 5% < Vnol?
933
YES
NO
Increase P/S output voltage
931
Turn on P/S output voltage
965
Reconfigure P/S voltage to predetermined first voltage value "Vout"
969
SYSTEM STATE: Connector is correctly attached to power laptop
971
YES
Does LL^G = LL^5?
973
NO
Recall previously stored Line Load value "LL^5"
975
ERROR: Prompt User
977
Store Line Load value "LL^G"
979
Sample Line Load (@ low output voltage)
981
Configure output voltage @ 3 VDC
983
NO
Vin Detected?
985
YES
Sample Vin at A/D I/O port #1
987
Insert Connector in Position #2
989
"Re-attach male connector" (if used to rotate selector)
991

Fig. 1A

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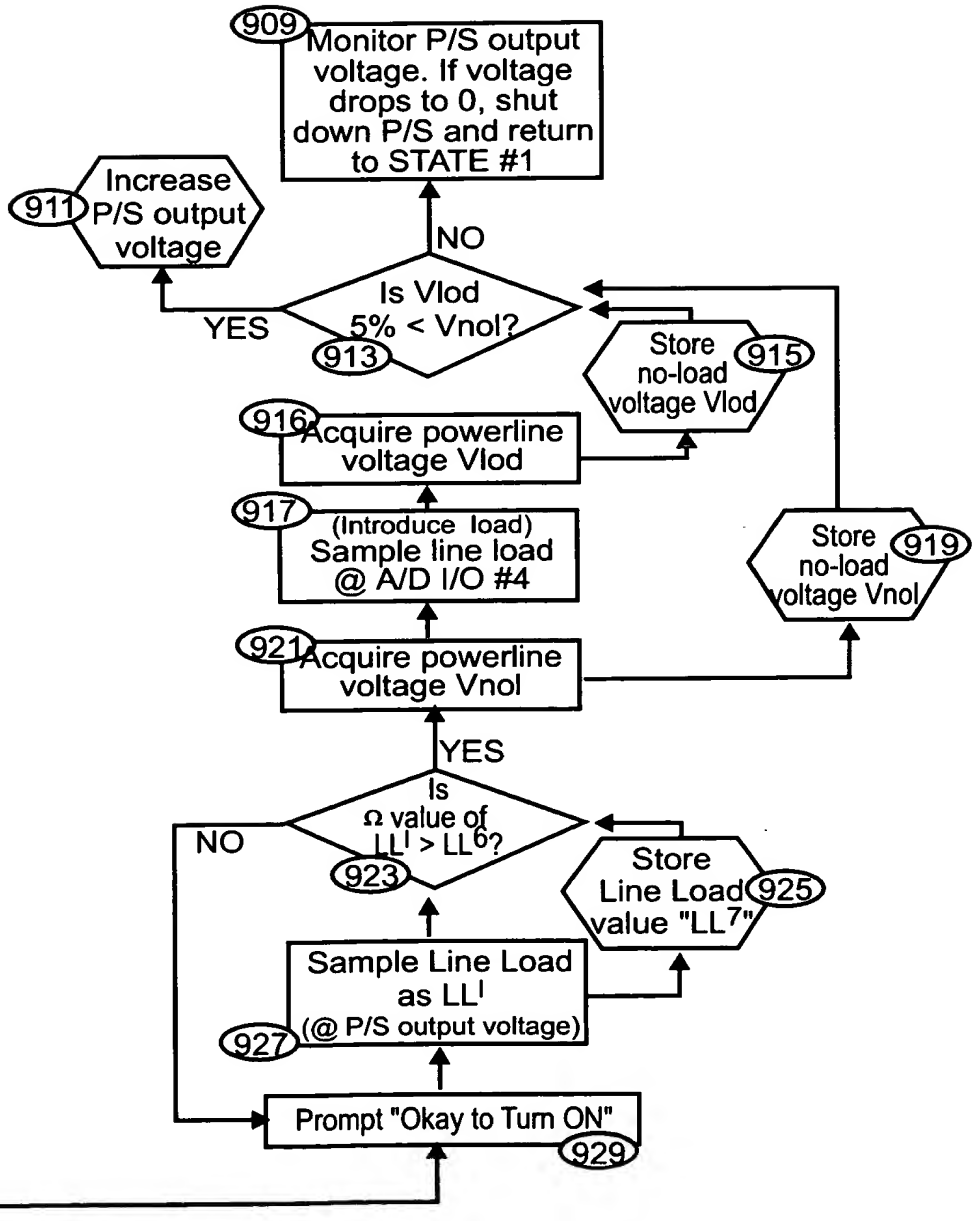

909
Monitor P/S output voltage. If voltage drops to 0, shut down P/S and return to STATE #1
NO
Is Vlod 5% < Vnol?
913
YES
911
Increase P/S output voltage
Store no-load voltage Vlod
915
916
Acquire powerline voltage Vlod
917
(Introduce load) Sample line load @ A/D I/O #4
Store no-load voltage Vnol
919
921
Acquire powerline voltage Vnol
YES
Is Ω value of LL^I > LL^6?
923
NO
Store Line Load value "LL^7"
925
Sample Line Load as LL^I (@ P/S output voltage)
927
Prompt "Okay to Turn ON"
929

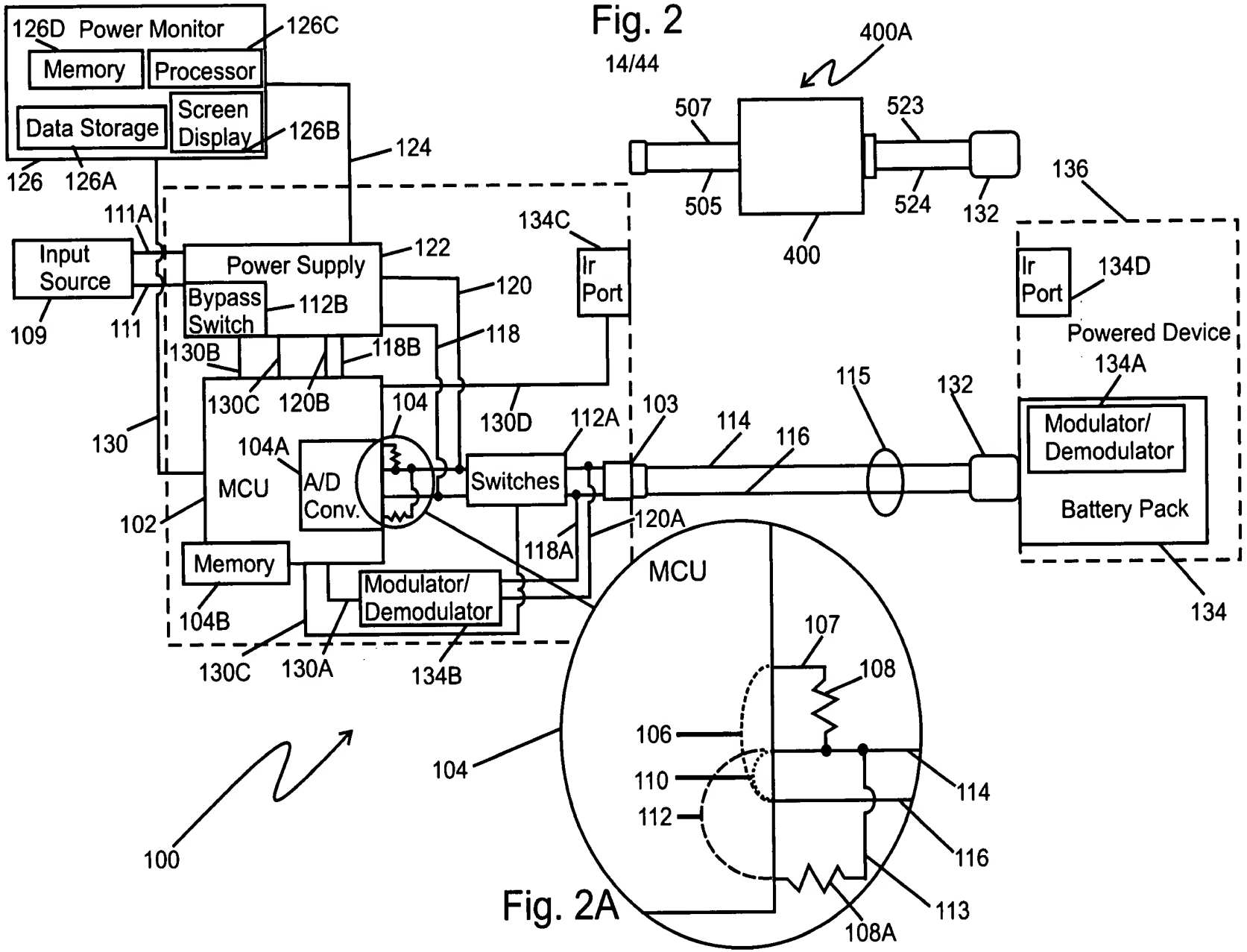

126D Power Monitor
126C
Memory
Processor
Data Storage
Screen Display
126B
126
126A
124
111A
Input Source
109
111
Power Supply
122
Bypass Switch
112B
120
118
130B
118B
130C
120B
104
130
130D
112A
103
104A
MCU
A/D Conv.
Switches
102
120A
118A
Memory
104B
Modulator/ Demodulator
130C
130A
134B
100
134C
Ir Port
400A
14/44
507
523
505
524
132
400
136
Ir Port
134D
Powered Device
134A
115
132
Modulator/ Demodulator
114
116
Battery Pack
134
MCU
107
108
106
110
112
104
114
116
113
108A

Fig. 2

Fig. 2A

Fig. 2B

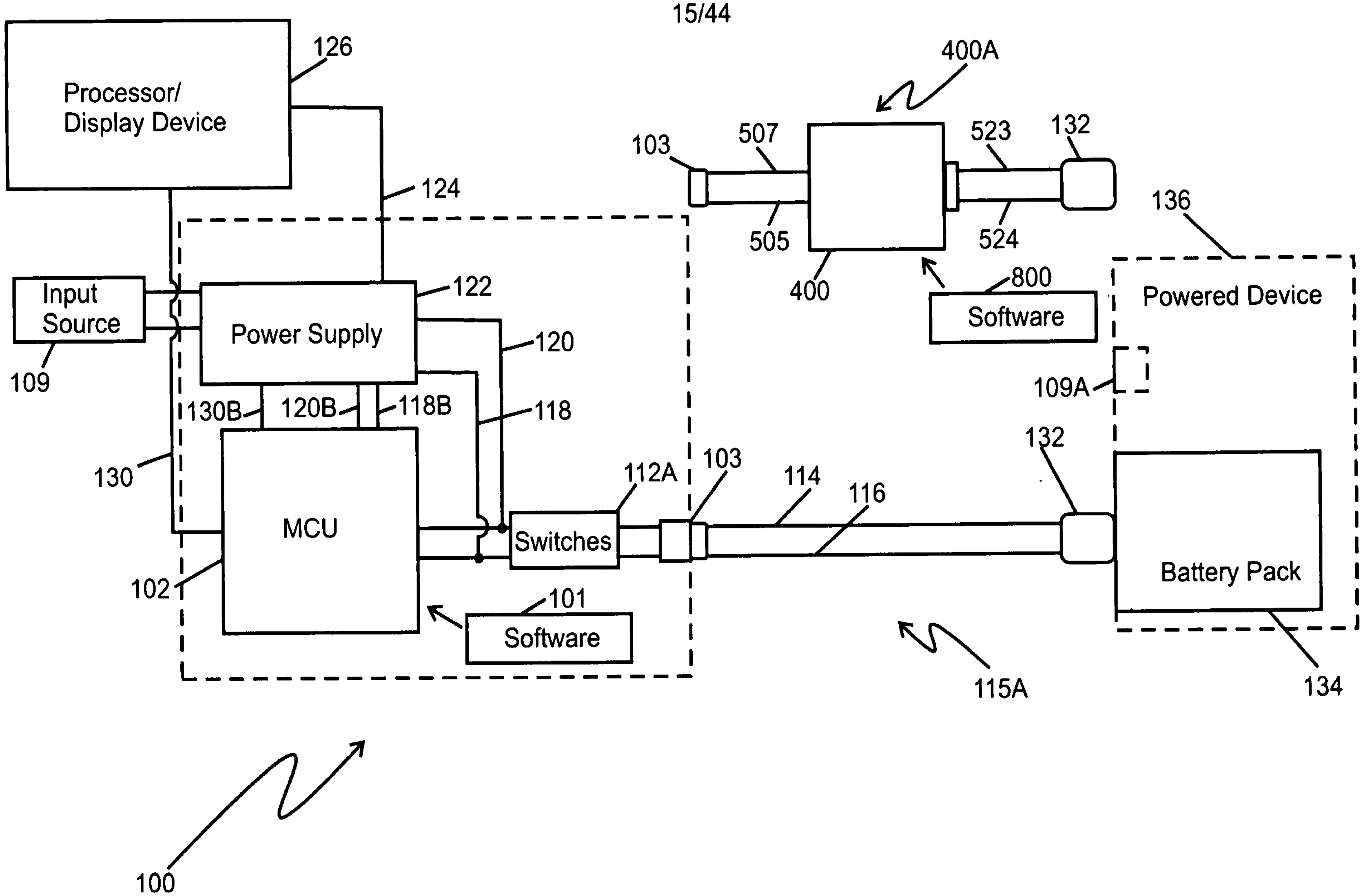

Processor/
Display Device
126
124
Input
Source
109
Power Supply
122
120
118
130B
120B
118B
130
MCU
102
Switches
112A
Software
101
103
114
116
132
Battery Pack
134
Powered Device
136
109A
115A
400A
103
507
505
400
523
524
132
Software
800
100

Fig. 3A
(Prior Art)
16/44

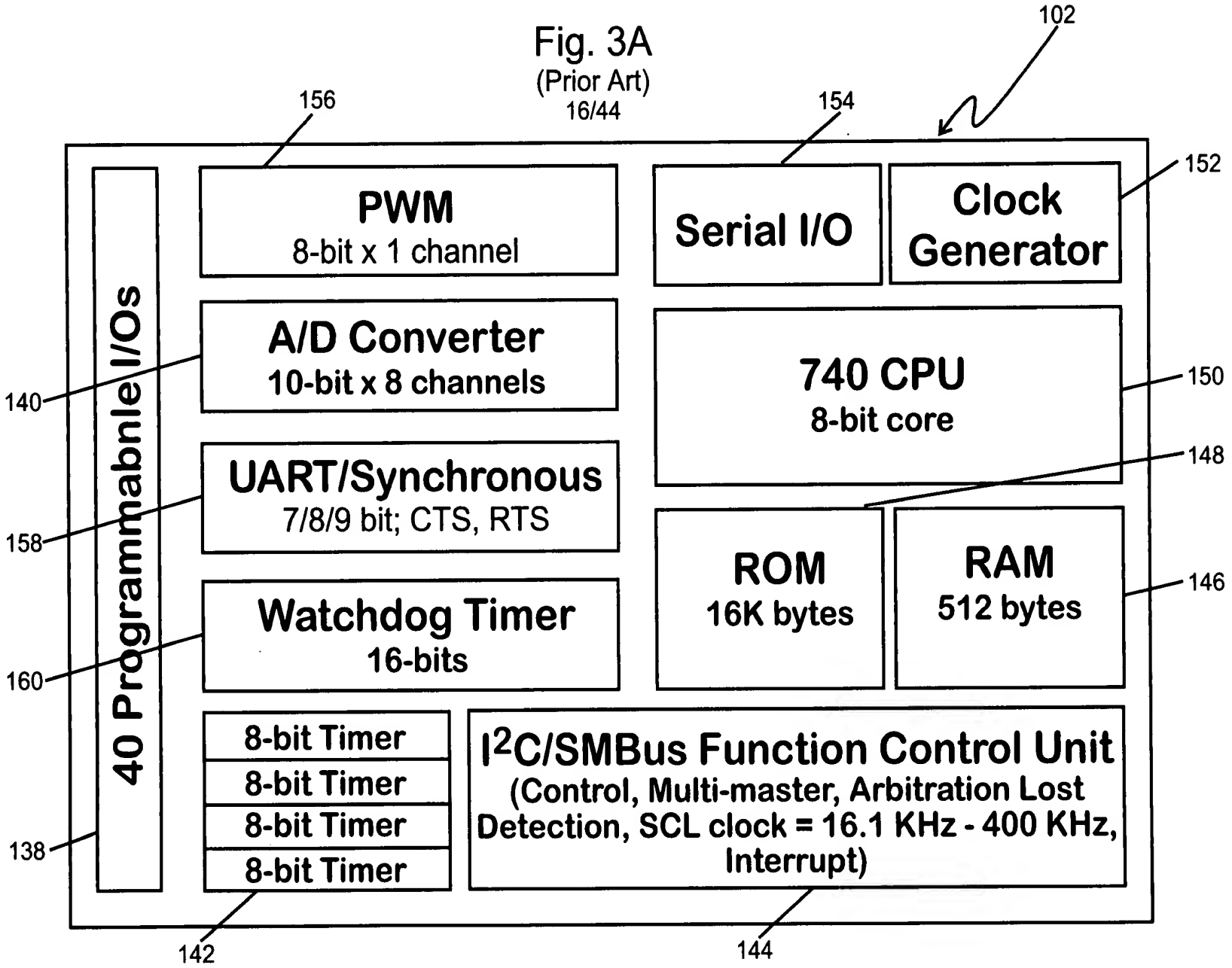


Fig. 3B
(Prior Art)
17/44

FUNCTIONAL BLOCK DIAGRAM
Single-Chip 8-Bit CMOS Microcontroller

104

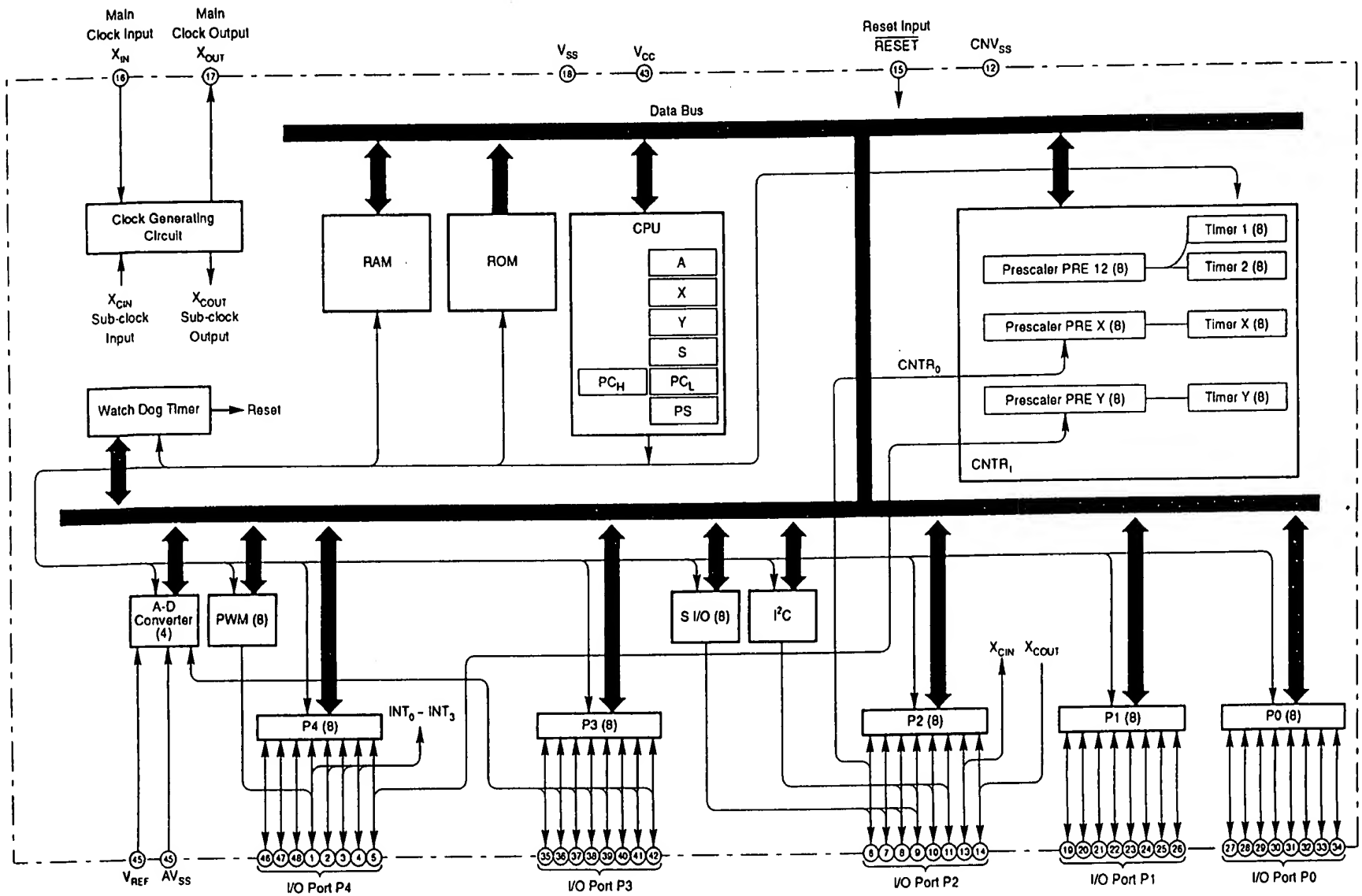
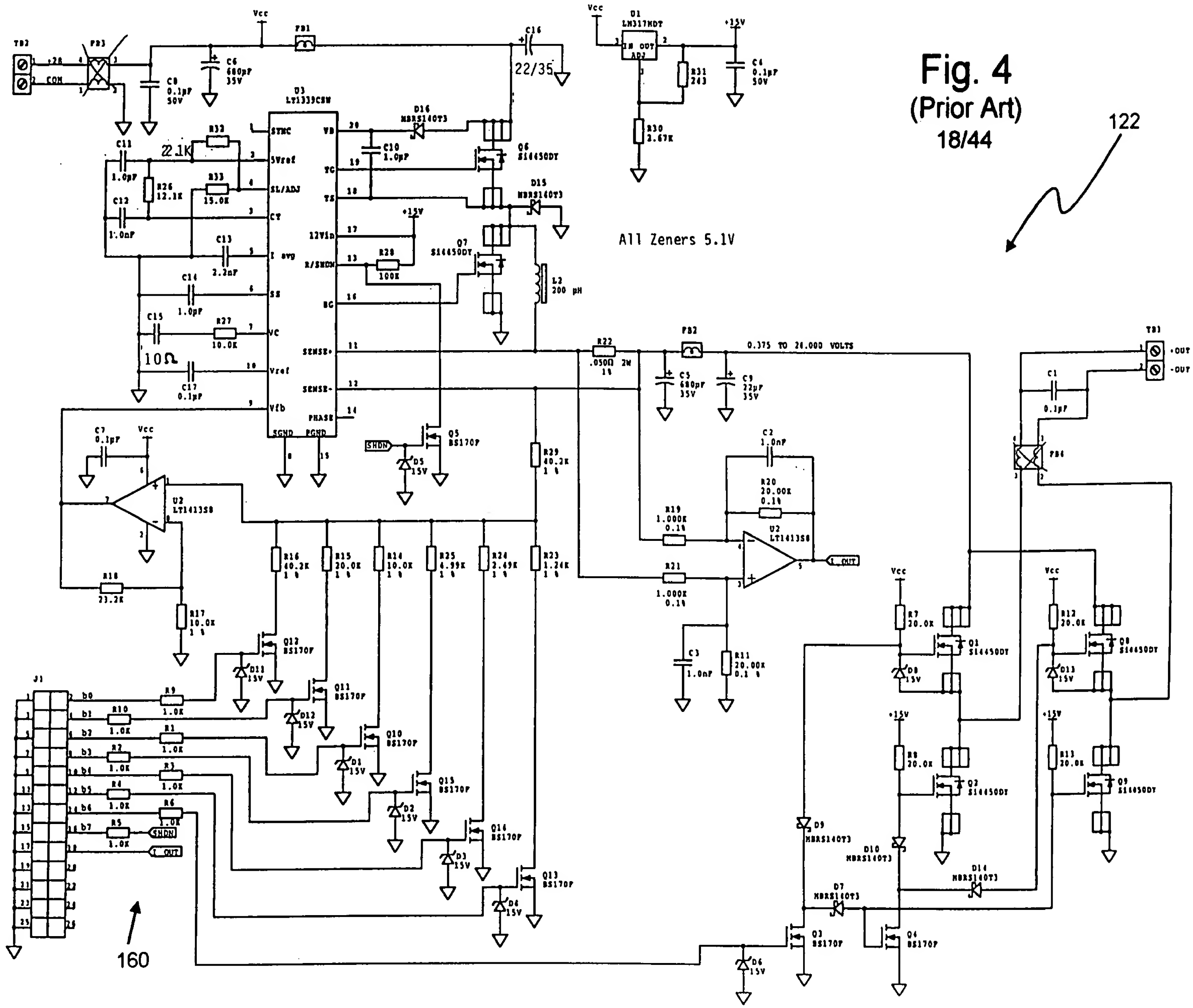
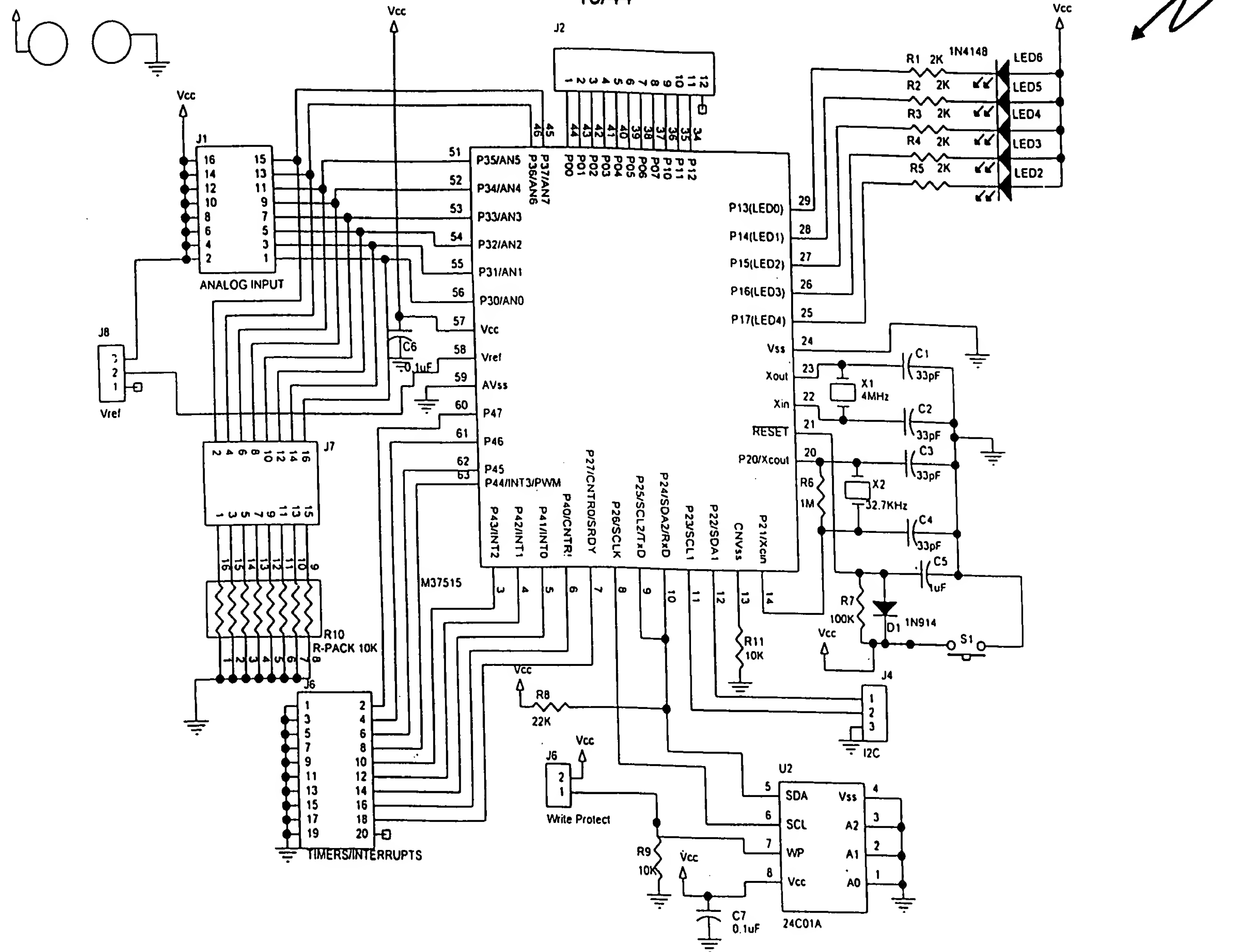


Fig. 4
(Prior Art)
18/44

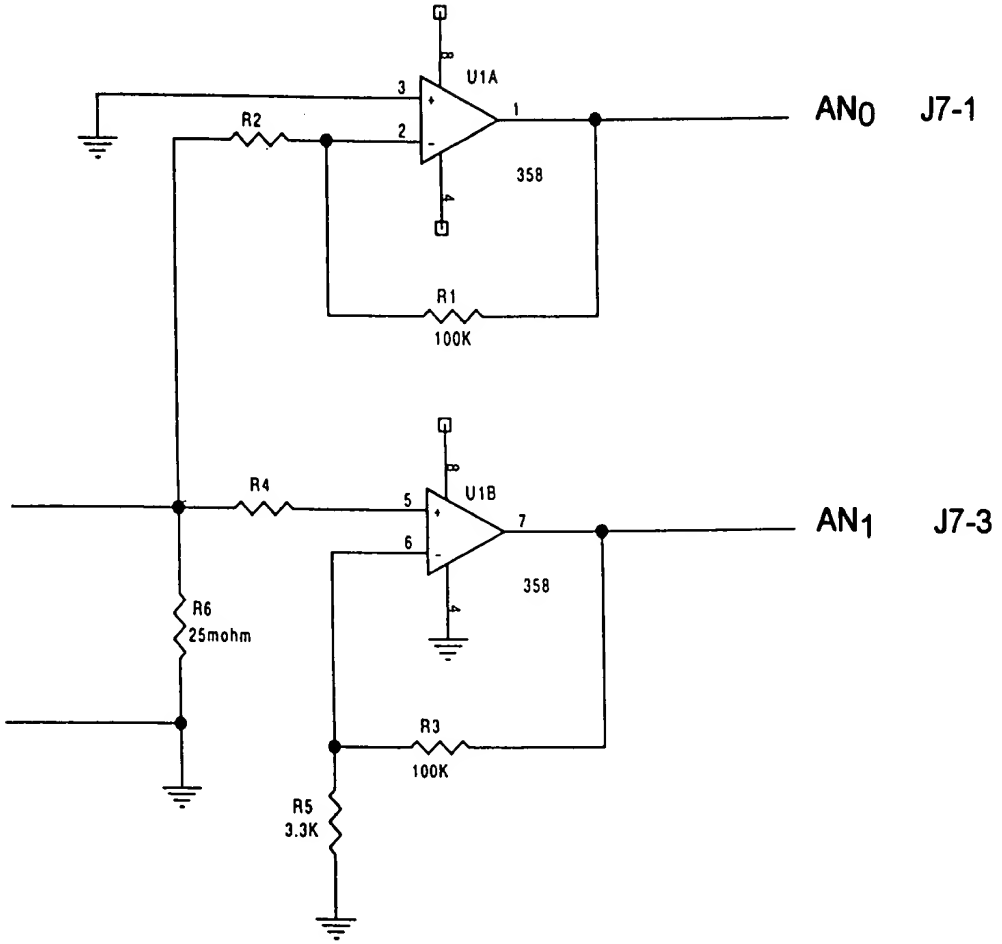


375

Fig. 5
(Prior Art)
19/44



Vcc
J1
ANALOG INPUT
J2
J7
J8
Vref
C6
0.1uF
R10
R-PACK 10K
J6
TIMERS/INTERRUPTS
M37515
P35/AN5
P34/AN4
P33/AN3
P32/AN2
P31/AN1
P30/AN0
Vcc
Vref
AVss
P47
P46
P45
P44/INT3/PWM
P37/AN7
P36/AN6
P00
P01
P02
P03
P04
P05
P06
P07
P10
P11
P12
P13(LED0)
P14(LED1)
P15(LED2)
P16(LED3)
P17(LED4)
Vss
Xout
Xin
RESET
P20/Xcout
P43/INT2
P42/INT1
P41/INT0
P40/CNTR1
P27/CNTR0/SRDY
P26/SCLK
P25/SCL2/TxD
P24/SDA2/RxD
P23/SCL1
P22/SDA1
CNVss
P21/Xcin
R1 2K
R2 2K
R3 2K
R4 2K
R5 2K
1N4148
LED6
LED5
LED4
LED3
LED2
C1 33pF
C2 33pF
C3 33pF
C4 33pF
C5 1uF
X1 4MHz
X2 32.7KHz
R6 1M
R7 100K
D1 1N914
S1
J4
I2C
R11 10K
R8 22K
Write Protect
R9 10K
C7 0.1uF
U2
SDA
SCL
WP
Vcc
Vss
A2
A1
A0
24C01A



107

Fig. 5A
(Prior Art)
20/44

107A

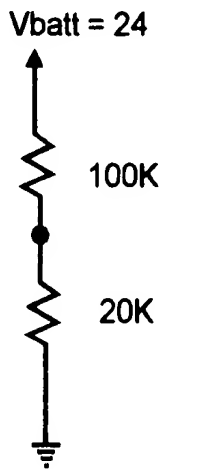
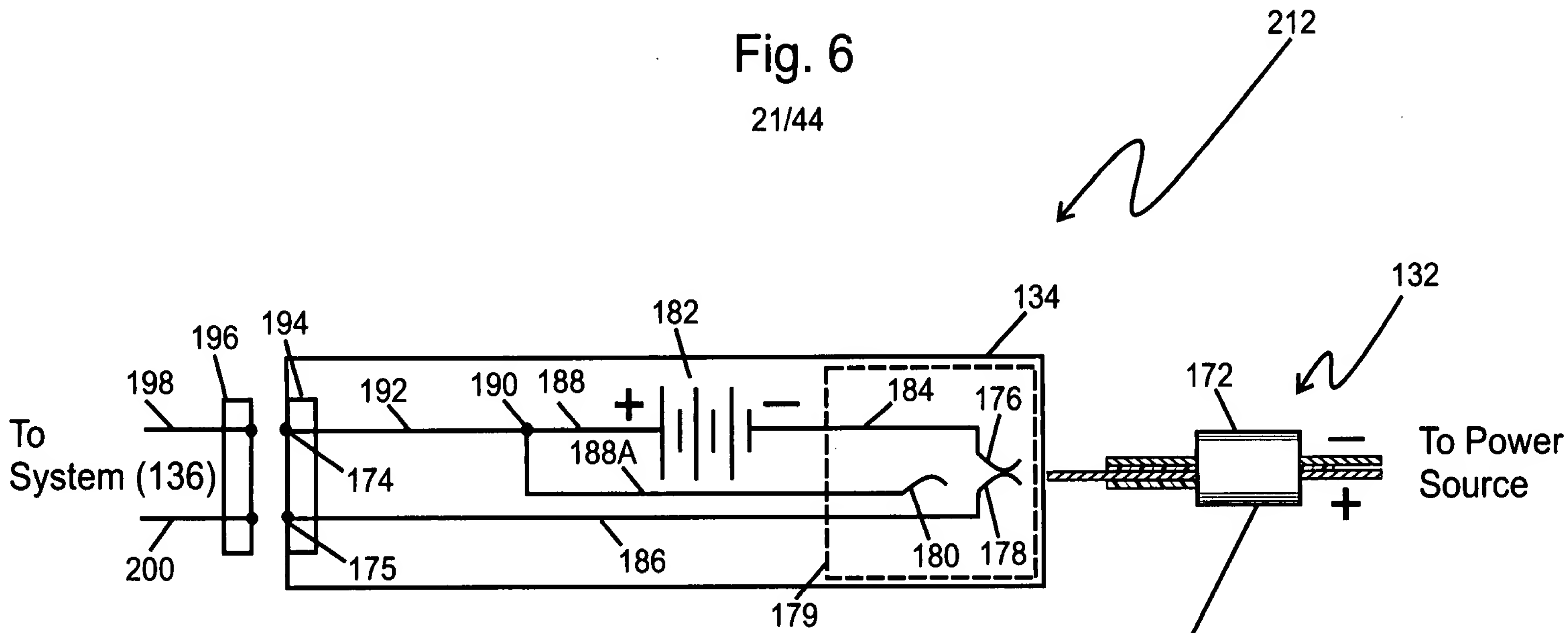


Fig. 6


212
132
182
134
196
194
198
192
190
188
+
−
184
176
172
To
System (136)
188A
174
To Power
Source
−
+
200
175
186
180
178
179

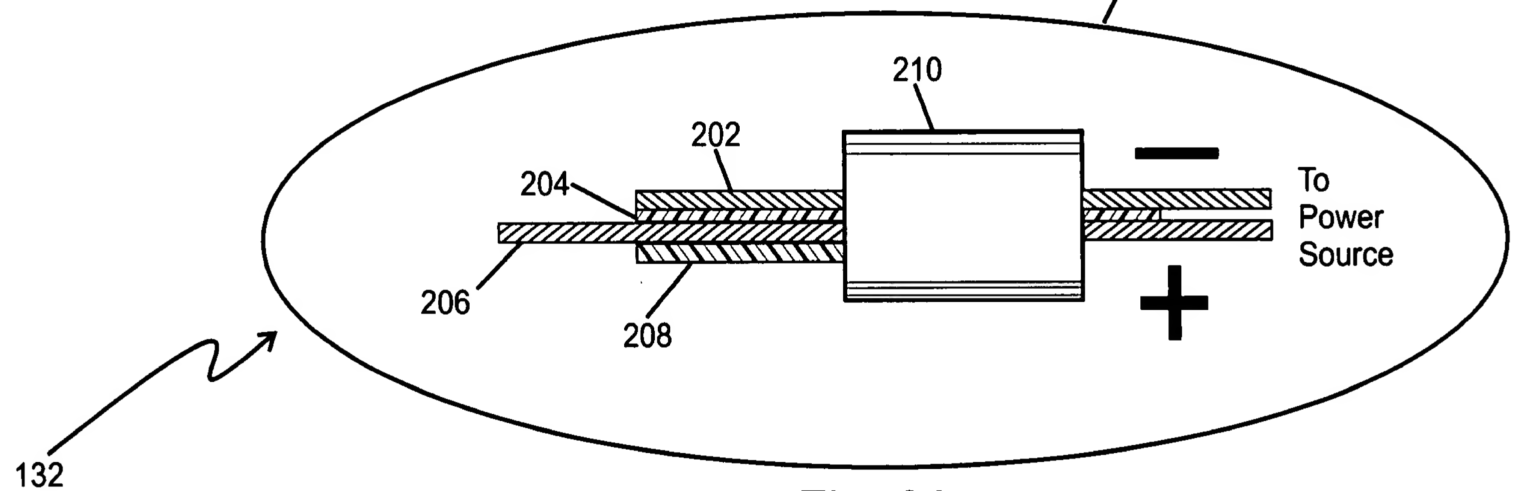

210
202
204
To
Power
Source
206
208
132

Fig. 6A

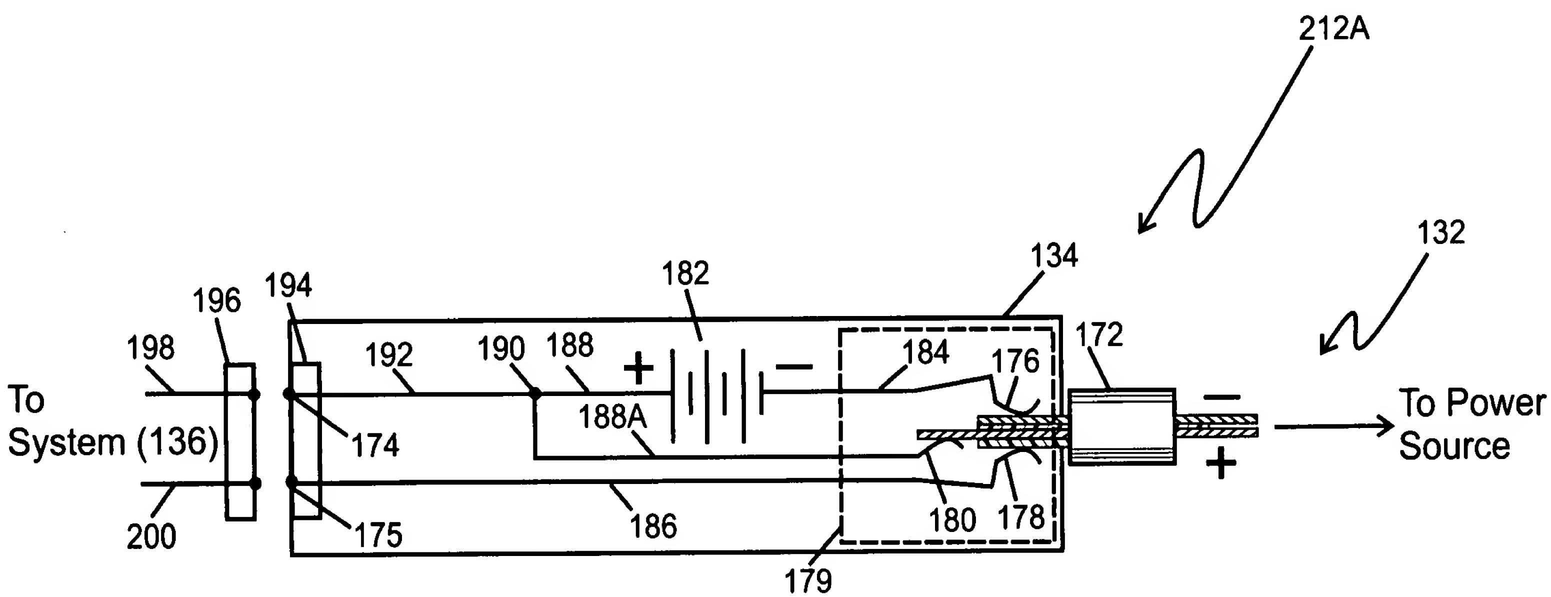

212A
132
134
182
172
196
194
184
176
198
192
190
188
To Power
Source
To
System (136)
188A
174
180
178
200
175
186
179

Fig. 6B

Fig. 6C

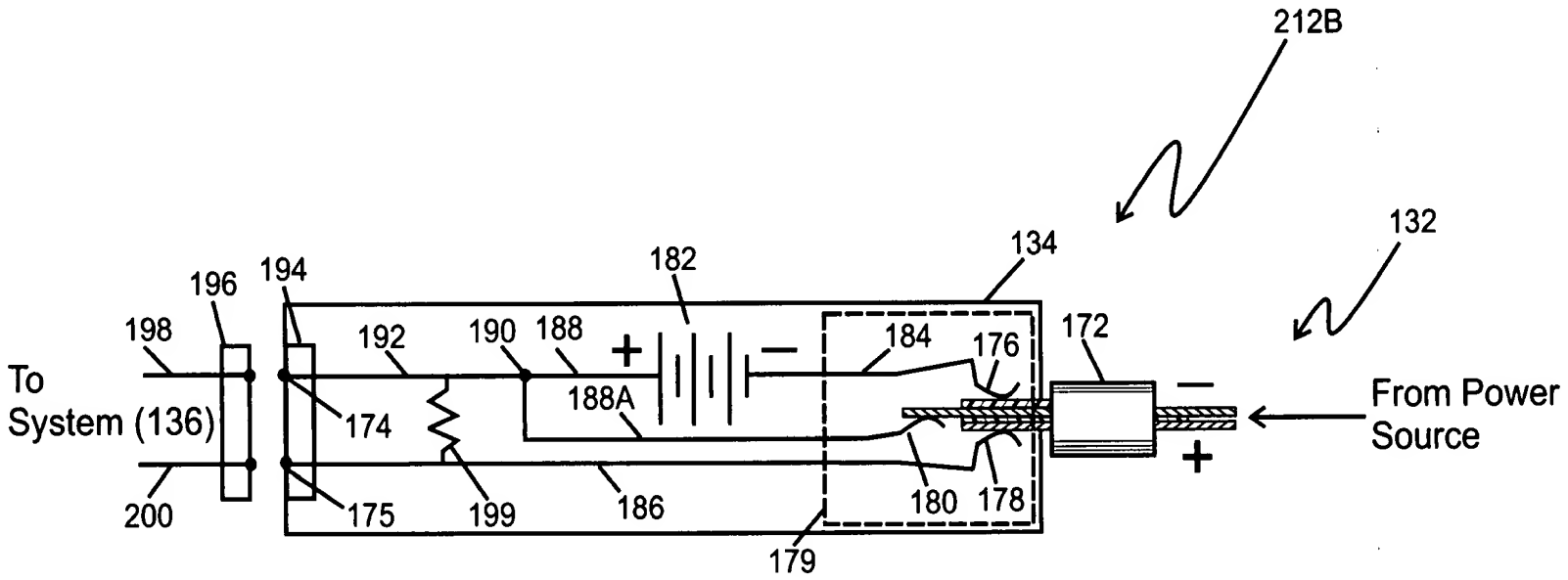

212B
132
134
182
196
194
198
192
190
188
184
176
172
To
System (136)
174
188A
From Power
Source
200
175
199
186
180
178
179

Fig. 6D

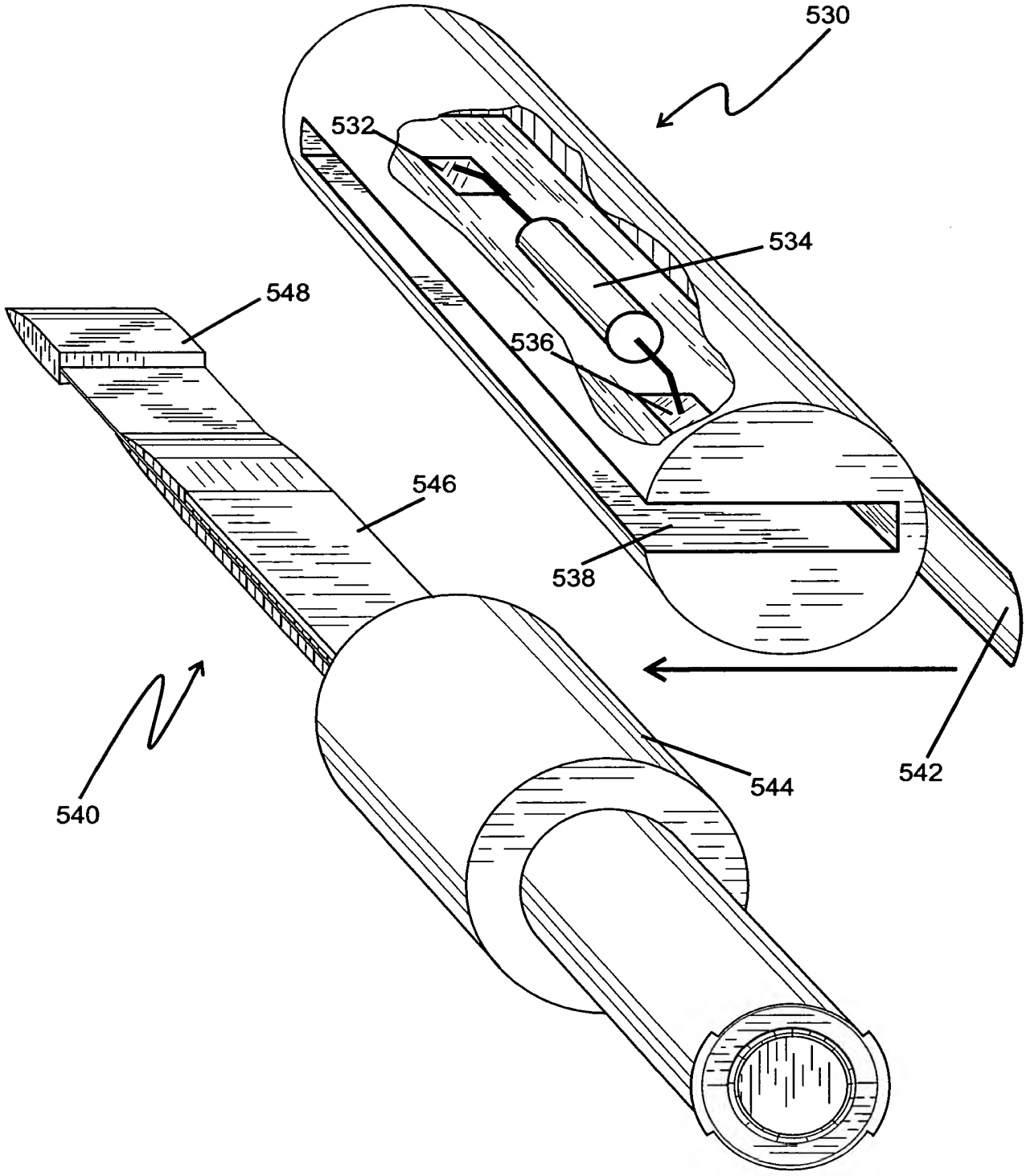


Fig. 6E

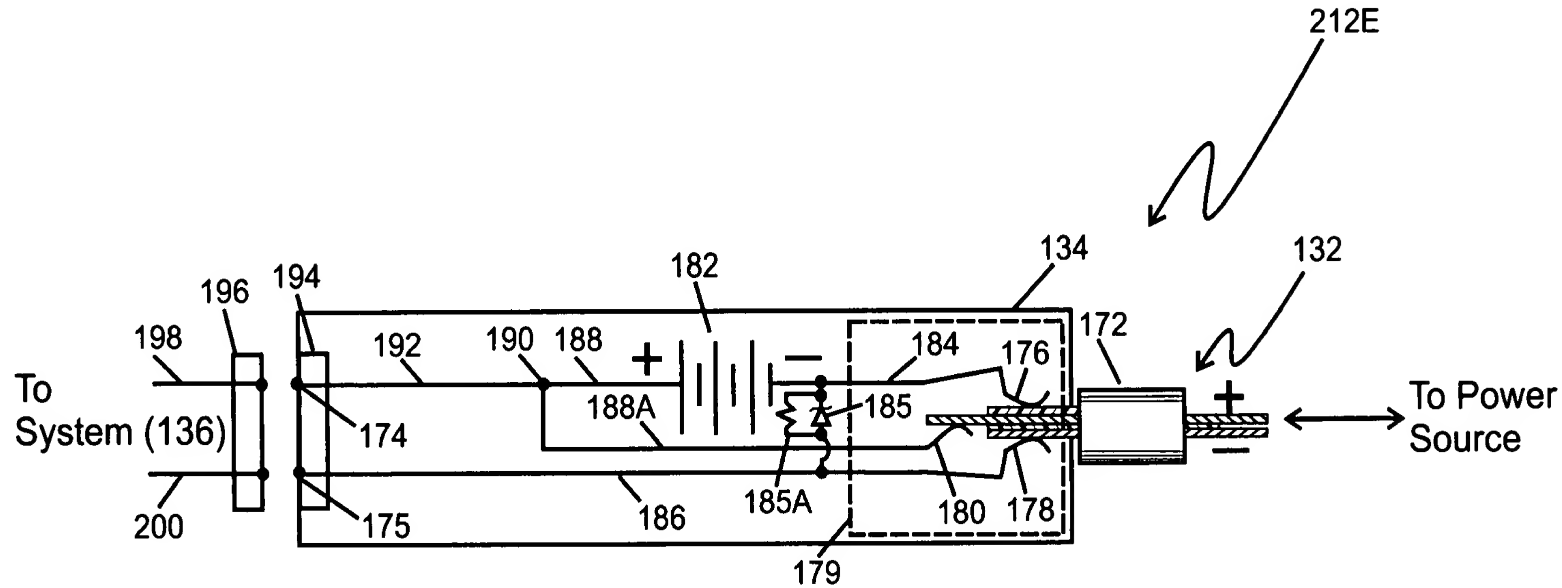


Fig. 6F

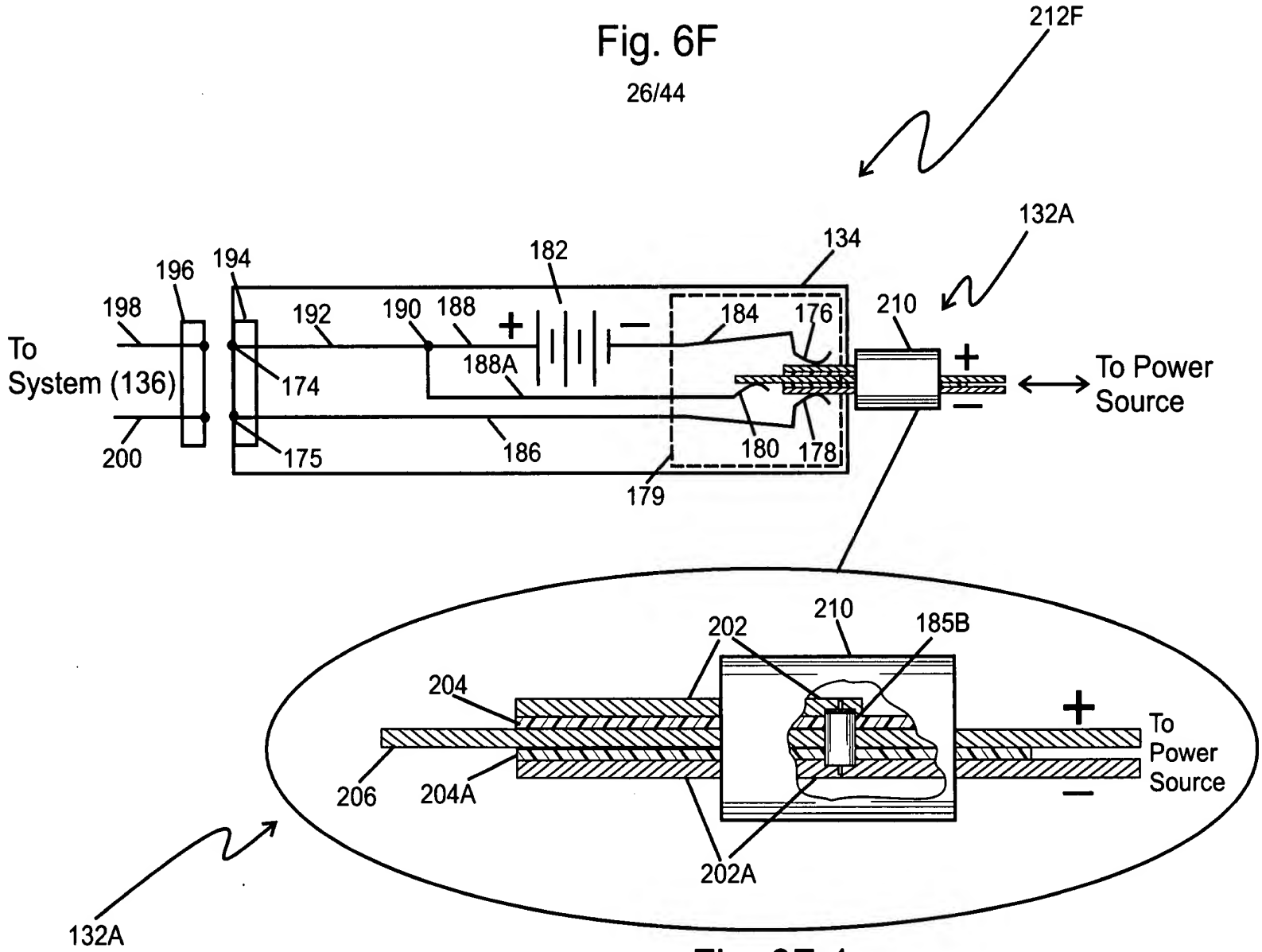


Fig. 6F-1

Fig. 7

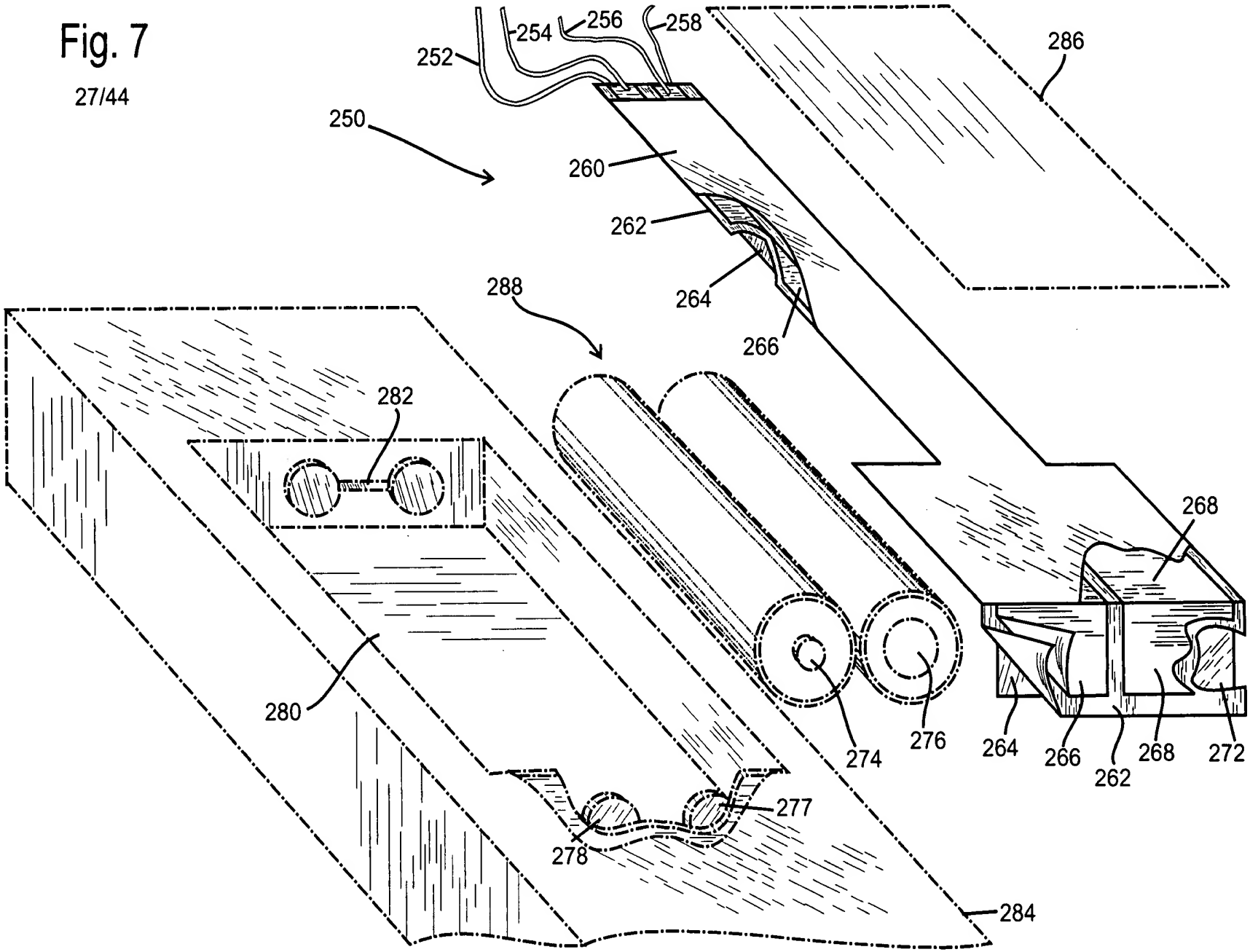

252
254
256
258
250
260
262
264
266
286
288
282
280
274
276
264
266
262
268
272
268
277
278
284

FIG. 8

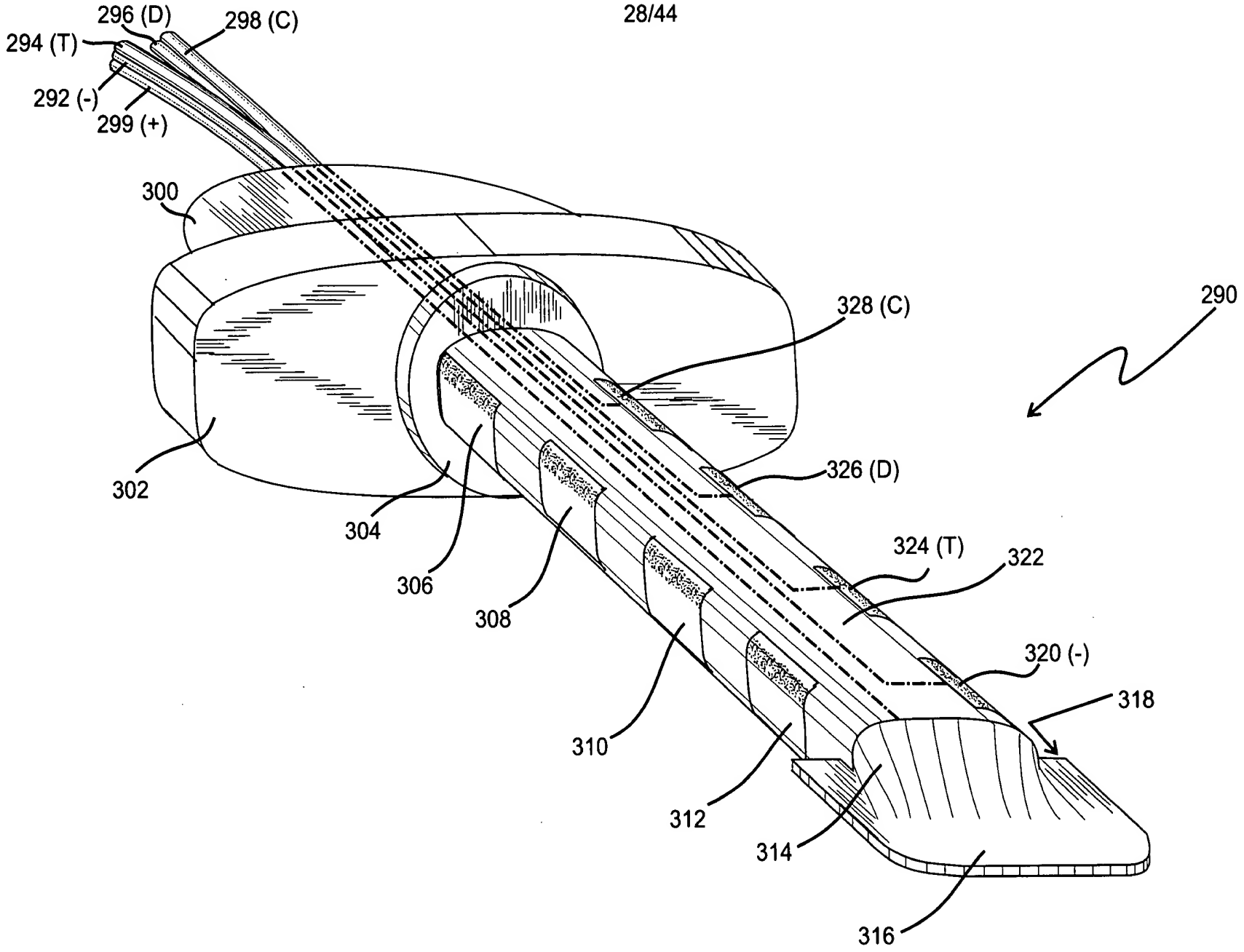

296 (D)
298 (C)
294 (T)
292 (-)
299 (+)
300
290
328 (C)
326 (D)
302
304
306
308
324 (T)
322
320 (-)
318
310
312
314
316

Fig. 9A

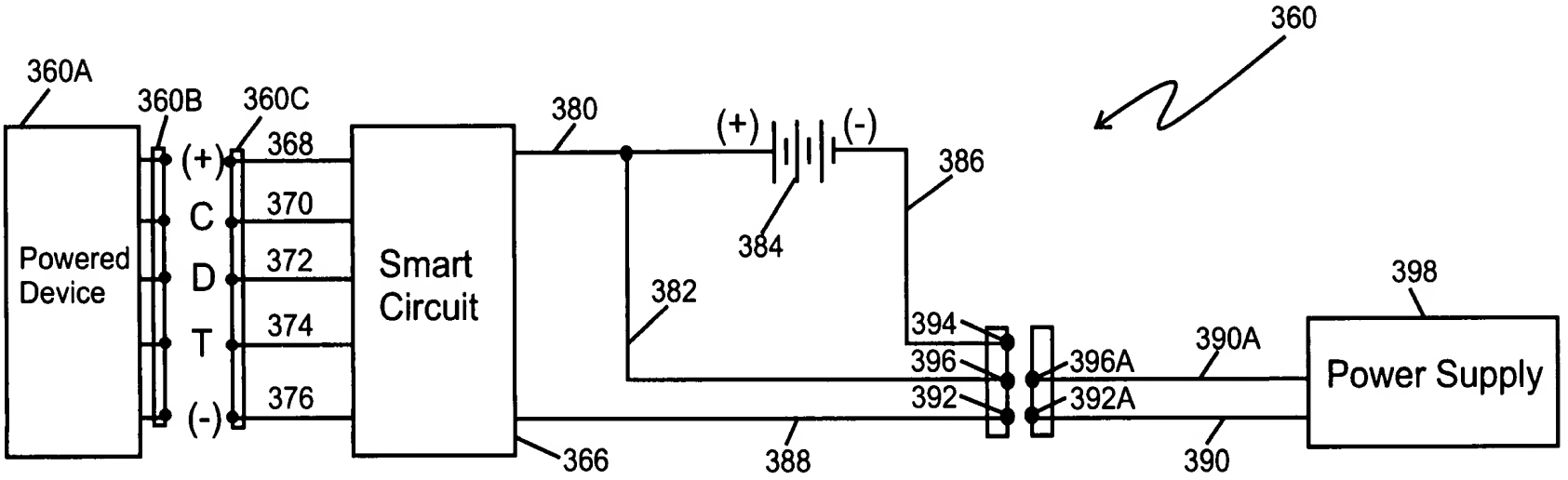

360
360A
360B
360C
Powered Device
(+)
C
D
T
(-)
368
370
372
374
376
Smart Circuit
380
(+)
(-)
384
386
382
394
396
392
396A
392A
390A
398
Power Supply
366
388
390

Fig. 9B

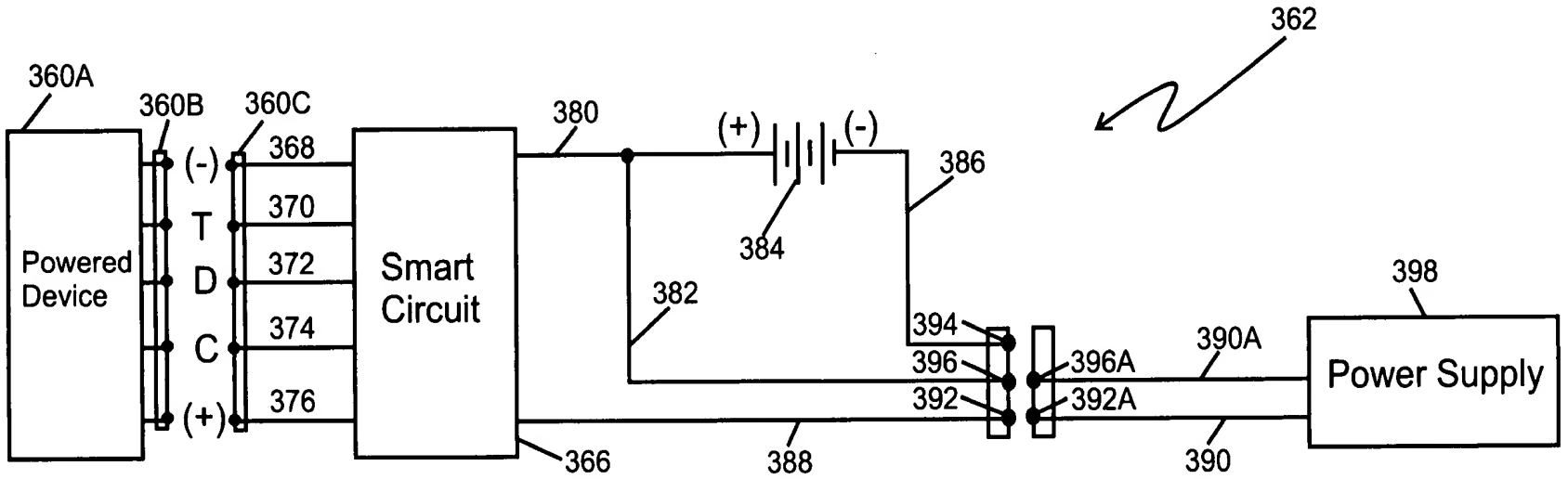

362
360A
360B
360C
380
(+)
(-)
386
368
370
372
374
376
(-)
T
D
C
(+)
Powered Device
Smart Circuit
384
382
394
396
392
396A
392A
390A
398
Power Supply
366
388
390

Fig. 9C

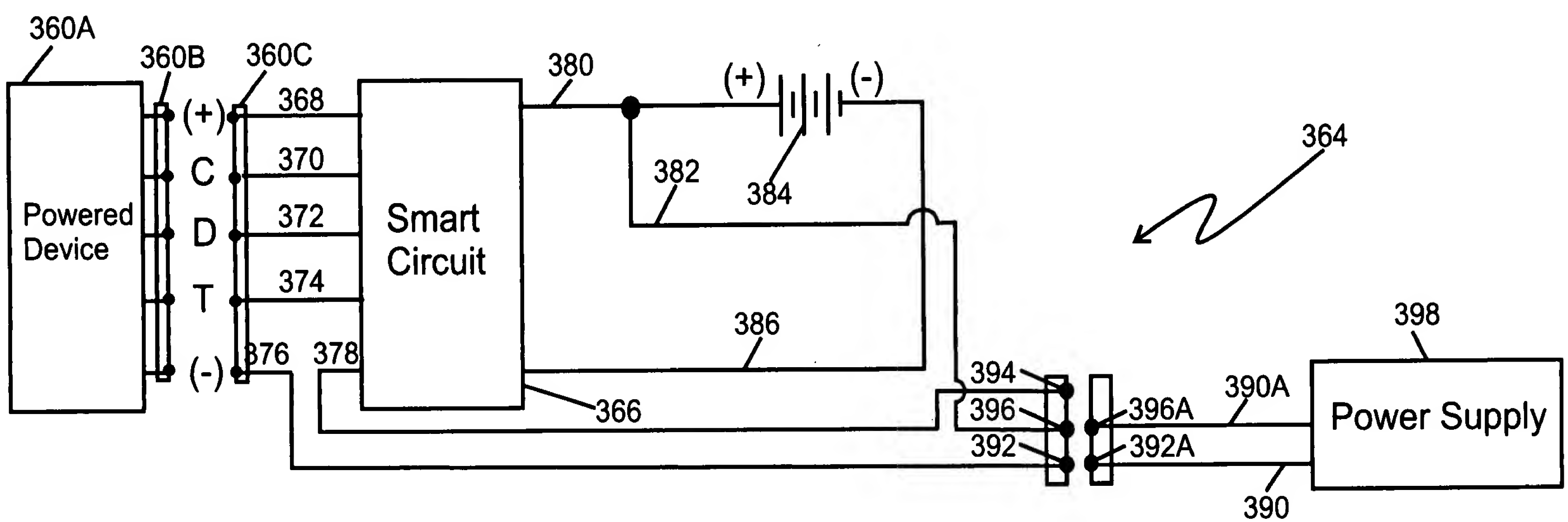

360A
360B
360C
Powered
Device
(+)
C
D
T
(-)
368
370
372
374
376
378
Smart
Circuit
380
(+)
(-)
382
384
386
366
364
394
396
392
396A
392A
390A
390
398
Power Supply

Fig. 9D

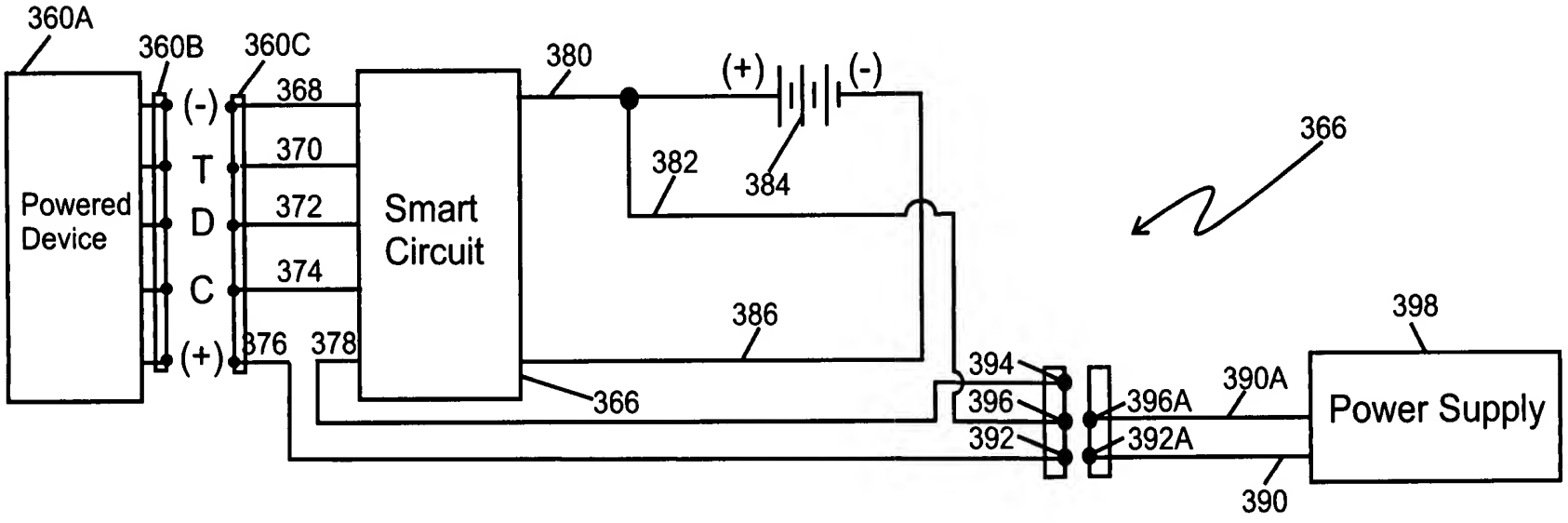

360A
360B
360C
380
(+)
(-)
368
370
372
374
376
378
T
D
C
(-)
(+)
Powered Device
Smart Circuit
382
384
386
366
394
396
392
396A
392A
390A
390
398
Power Supply

FIG. 10

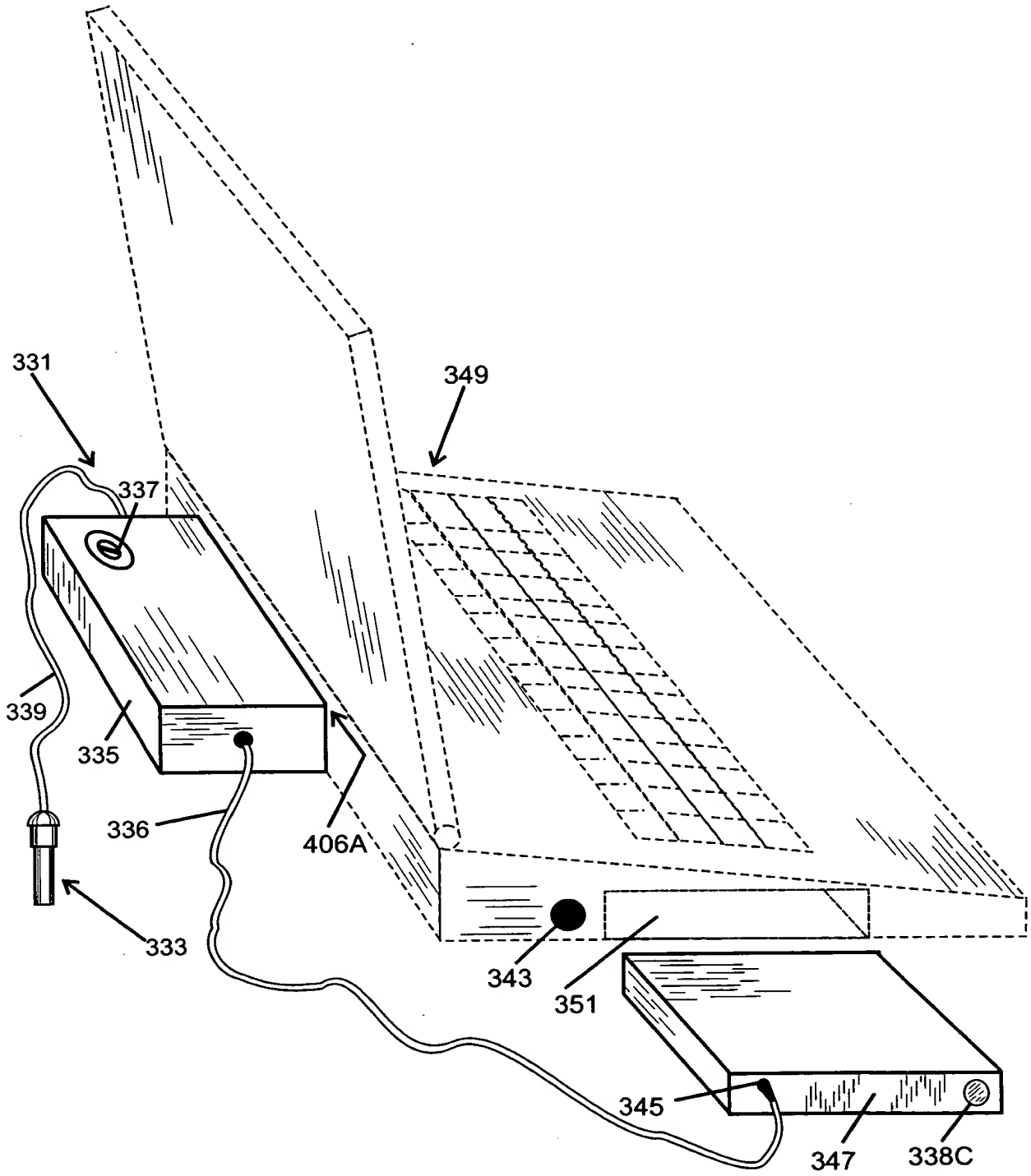


FIG. 11

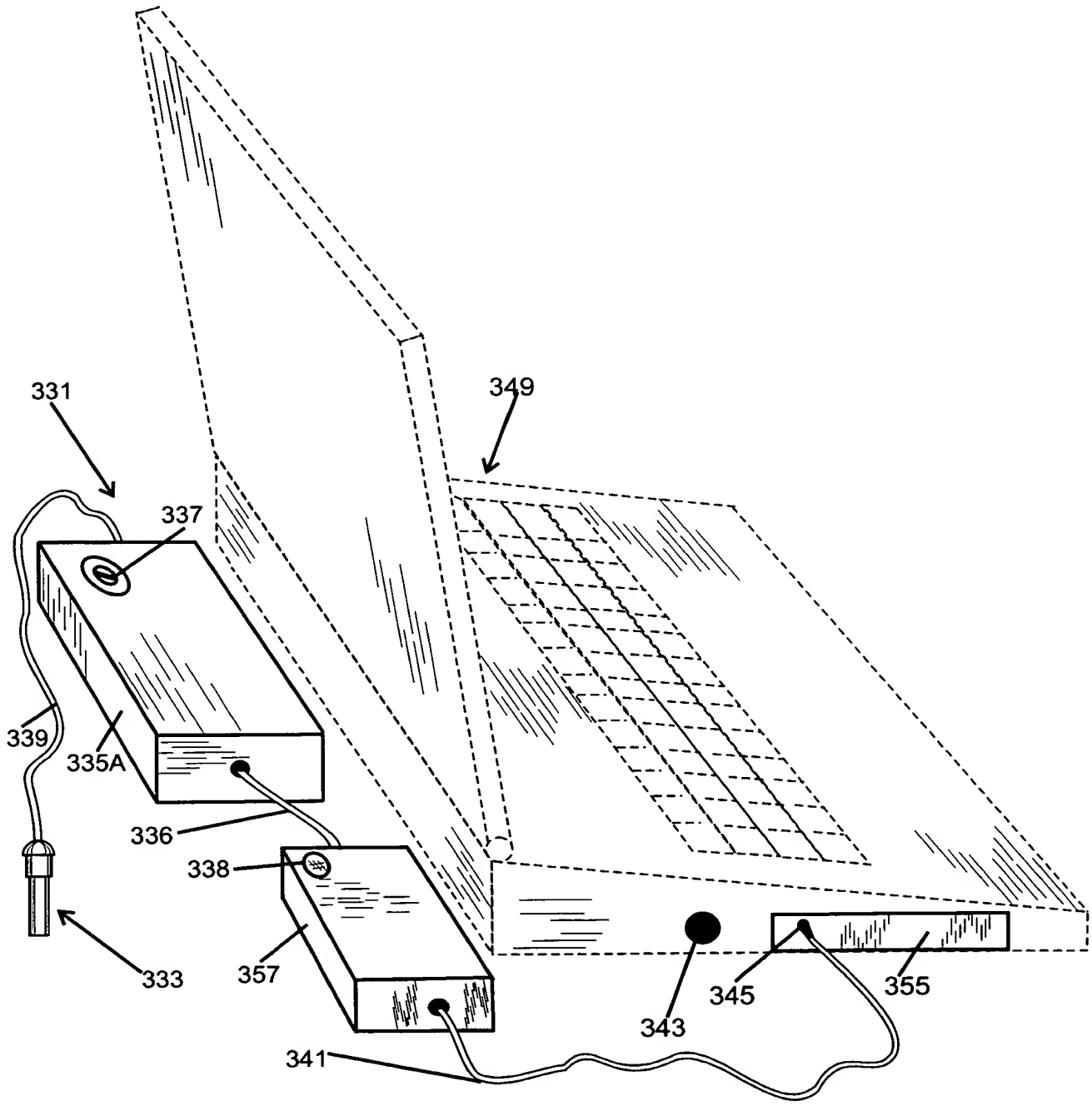


FIG. 12

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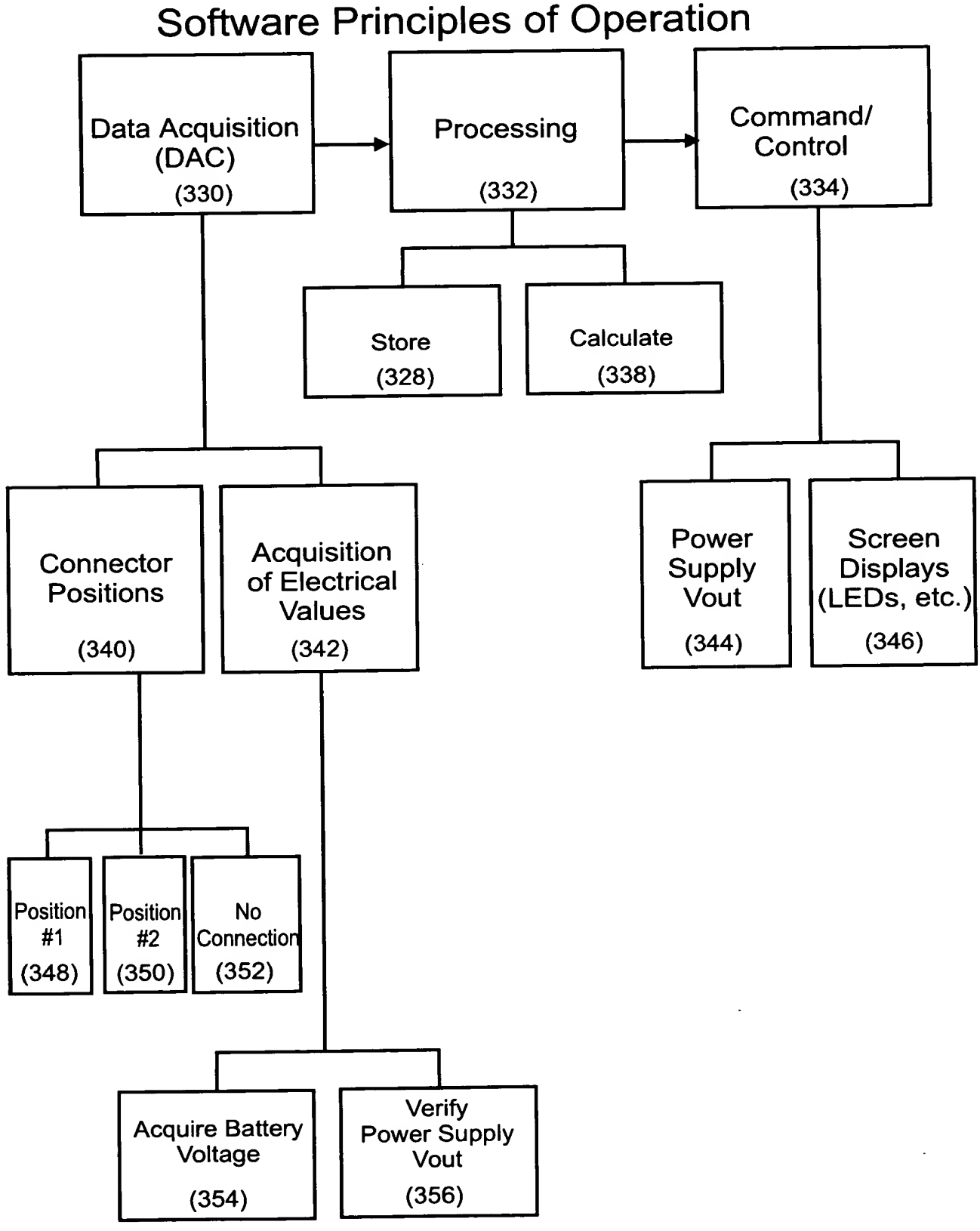
Software Principles of Operation
Data Acquisition (DAC) (330)
Processing (332)
Command/ Control (334)
Store (328)
Calculate (338)
Connector Positions (340)
Acquisition of Electrical Values (342)
Power Supply Vout (344)
Screen Displays (LEDs, etc.) (346)
Position #1 (348)
Position #2 (350)
No Connection (352)
Acquire Battery Voltage (354)
Verify Power Supply Vout (356)

FIG. 13

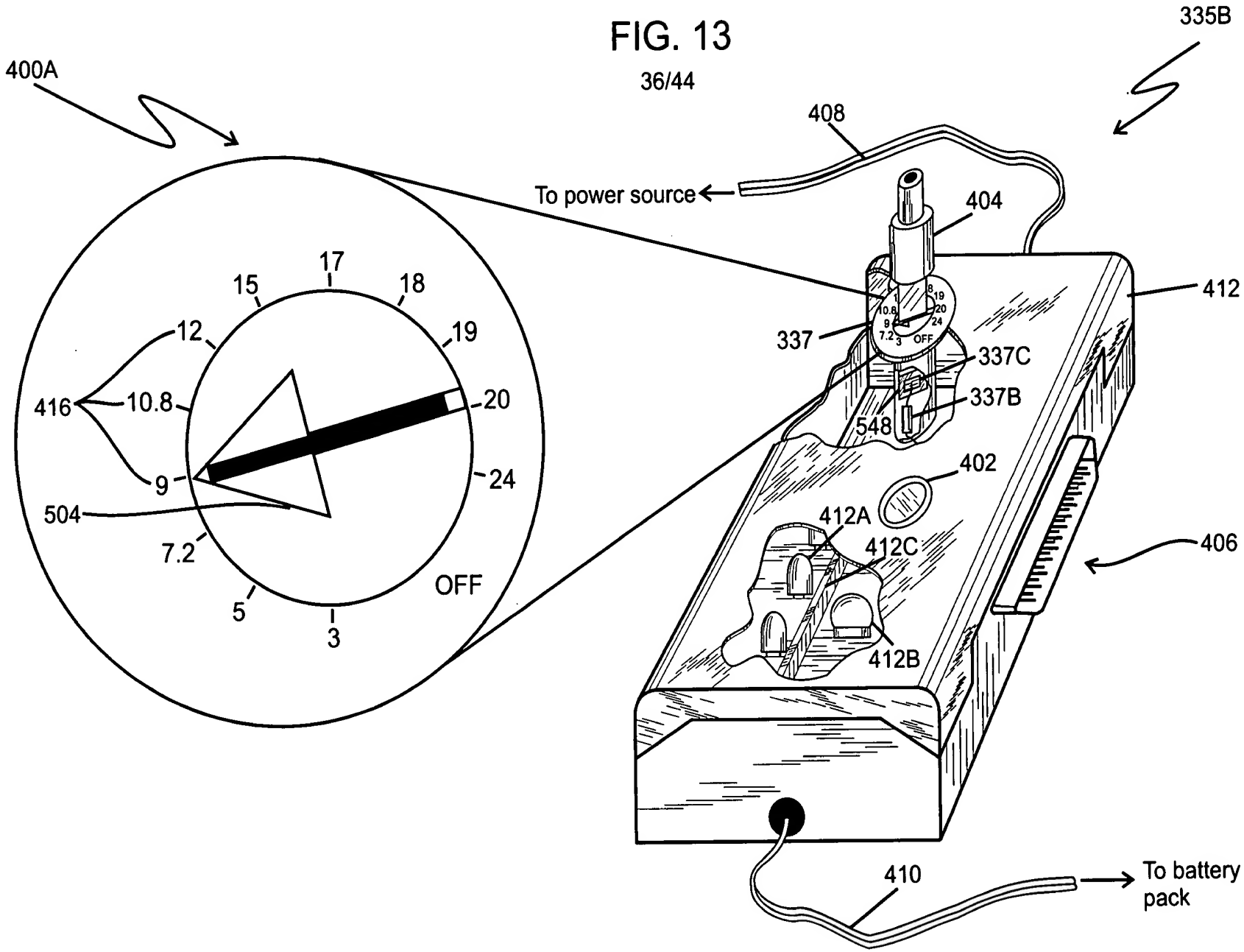
400A
335B
408
To power source
404
412
337
337C
337B
548
402
412A
412C
412B
406
410
To battery pack
416
12
15
17
18
19
10.8
20
9
24
504
7.2
5
3
OFF

Fig. 13A

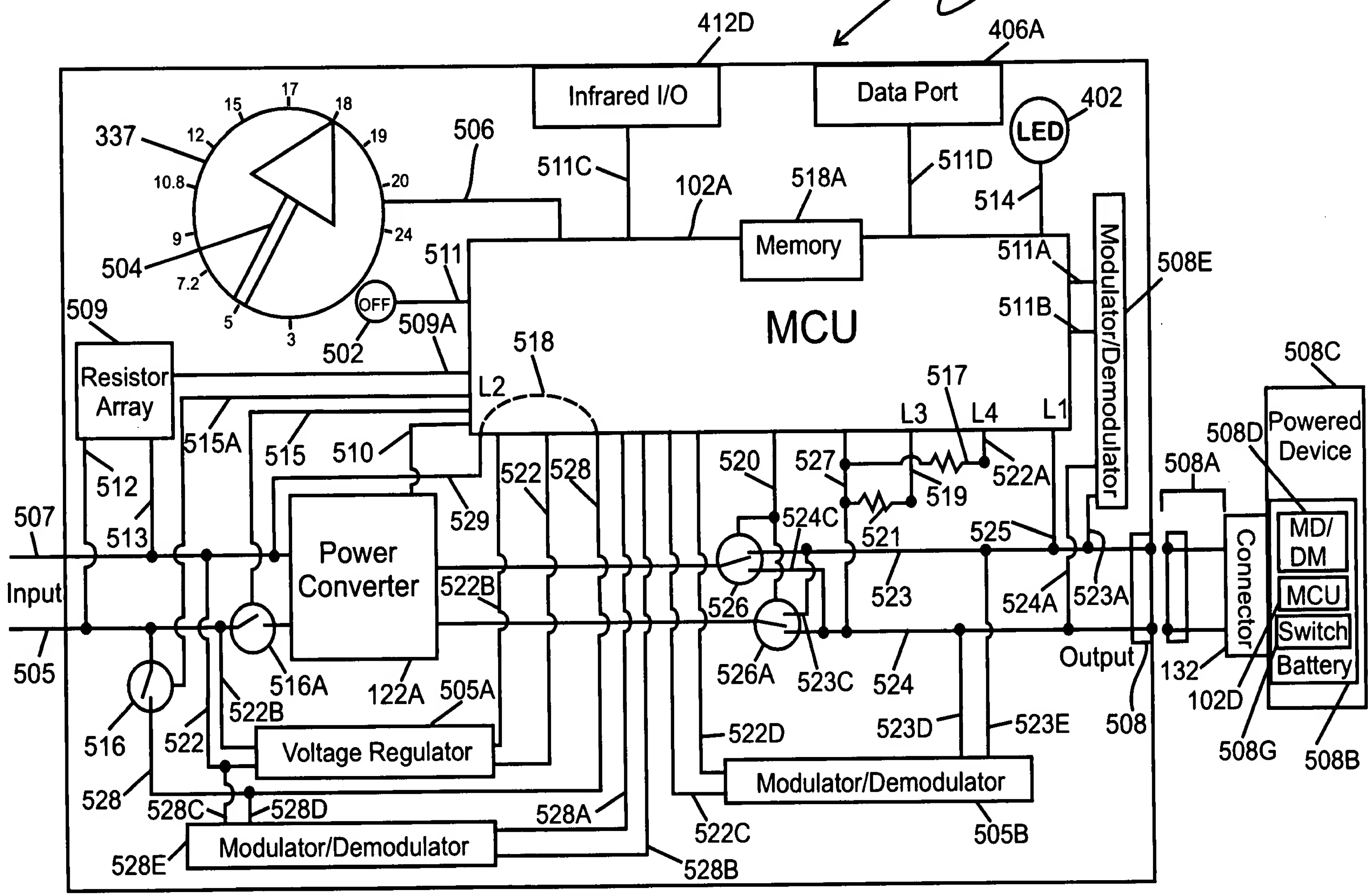
400
412D
406A
Infrared I/O
Data Port
LED
402
337
504
509
Resistor Array
506
511C
102A
518A
Memory
511D
514
511A
511B
MCU
Modulator/Demodulator
508E
511
509A
502
OFF
518
L2
L3
L4
L1
517
515A
515
510
512
513
507
Input
505
Power Converter
522B
529
522
528
520
527
519
521
522A
524C
525
508C
Powered Device
508D
508A
MD/DM
MCU
Switch
Battery
Connector
526
523
524A
523A
516A
122A
505A
526A
523C
524
Output
132
102D
508G
508B
516
522B
Voltage Regulator
522D
523D
523E
508
528C
528D
528A
Modulator/Demodulator
505B
522C
528E
528B

Fig 14

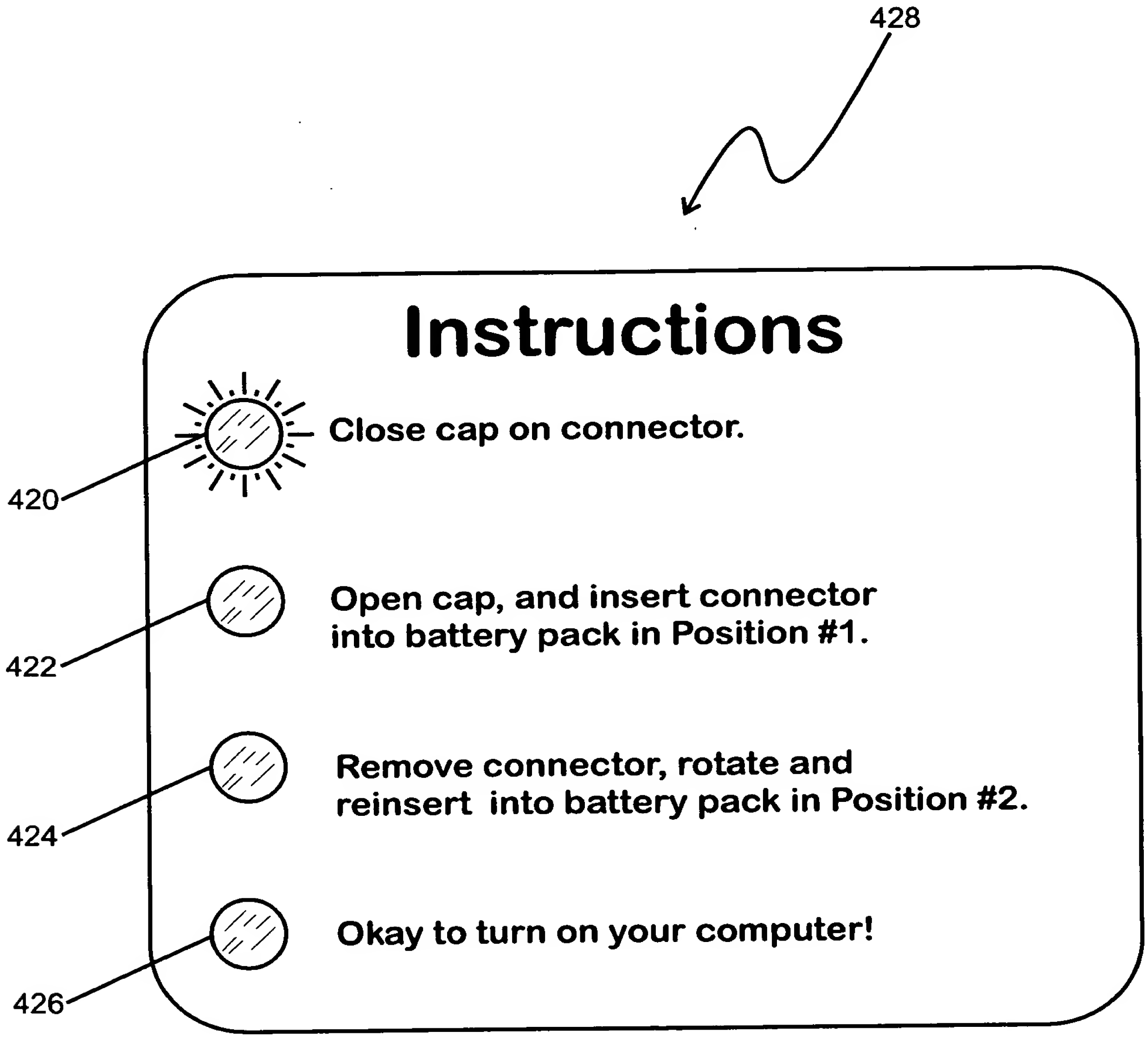

Fig. 15

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Vmin and Vmax Compared to Standard Battery Pack Voltages

Voltages Are Shown As Design Minimum/Maximum Values					
	Ni-Cad	**NiMH**	**Li-Ion (Coke)**	**Li-Ion (Graphite)**	**Li-Polymer**
Cell Voltage	1.25/1.299	1.25/1.32	2.50/4.20	3.60/4.10[1]	3.0/4.20
Cells/Pack[2]					
3	----	----	7.50/12.60	10.80/12.30	9.0/12.60
4	5.00/5.196	5.00/ 5.28	10.00/16.80	14.4/16.4	12.0/16.80
6	7.5/7.794	7.5/7.92	7.50/12.60	10.8/12.3	9.0/12.60
8	10.0/10.392	10.0/10.56	10.00/16.80	14.4/16.4	12.0/16.80
10	12.5/12.99	12.5/13.2	----	----	----
12	15.00/15.588	15.00/15.840	----	----	----
Minimum Cell Voltage[3]					
4	4.00	4.00	10.00	10.00	10.00
6	6.00	6.00	7.50	7.50	7.50
8	8.00	8.00	10.00	10.00	10.00
10	10.00	10.00	----	----	----
12	12.00	12.00	----	----	----
Load Current[4]	>1C	0.5C	1C	1C	1C

[1] Graphite-based Li-Ion cells are rated @ 3.0-4.1 VDC. Coke-based Li-Ion cells are rated @ 2.5-4.2 VDC.

[2] Voltage and cells-per-pack do not take into consideration whether cells in a pack are series or parallel wired. For example, a 14.4-volt Li-Ion pack can have two cell wiring configurations. Four-cell packs yield a 14.4 VDC pack rated @ 2025 MAh, while 8-cell packs are rated @ 14.4 VDC 4050 MAh.

[3] "Minimum Cell Voltage" is the lowest voltage to which a cell can safely be discharged.

[4] Load current is typically expressed as a ratio of charge rate.

Fig. 16

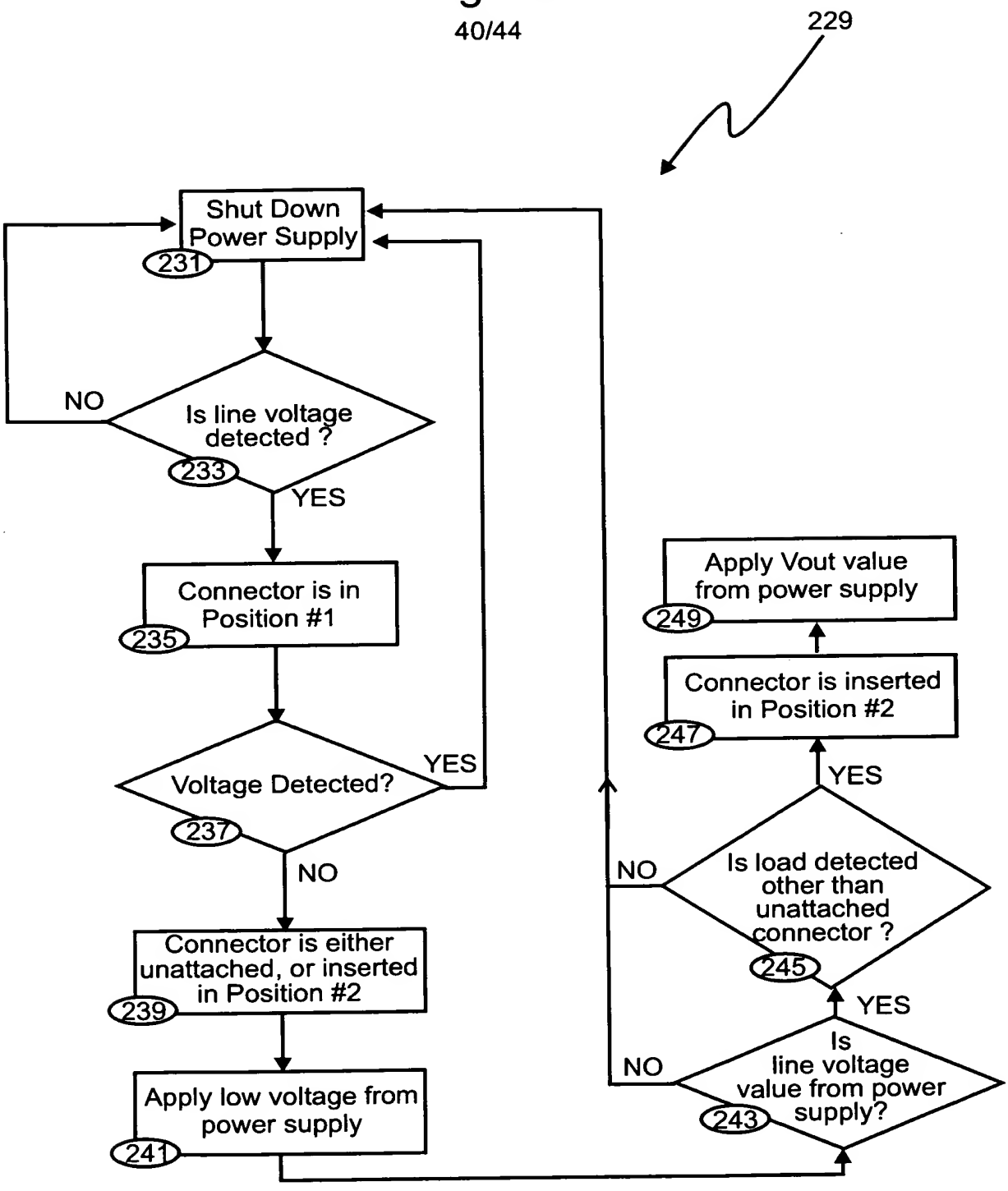
229
Shut Down Power Supply
231
Is line voltage detected ?
233
NO
YES
Connector is in Position #1
235
Voltage Detected?
237
YES
NO
Connector is either unattached, or inserted in Position #2
239
Apply low voltage from power supply
241
Is line voltage value from power supply?
243
NO
YES
Is load detected other than unattached connector ?
245
NO
YES
Connector is inserted in Position #2
247
YES
Apply Vout value from power supply
249

Fig. 17

1001

Connector Position	Software/Hardware Sensing Function
Not Connected	Sense voltage first. If no voltage detected, apply low power and sense current.[1]
Position #1 (To Battery Cells)	Sense voltage.[2]
Position #2 (To Powered Device)	Sense voltage first. If no voltage detected, apply low power and sense current.[3]

[1] If connector cover 530 in Fig. 6D is used, the resistive value of element 534 is predetermined and available in a software look-up table.
[2] Voltage detected will be from the battery, and not the power supply.
[3] Detected current will not be the same as that in footnote #1.

Fig. 18

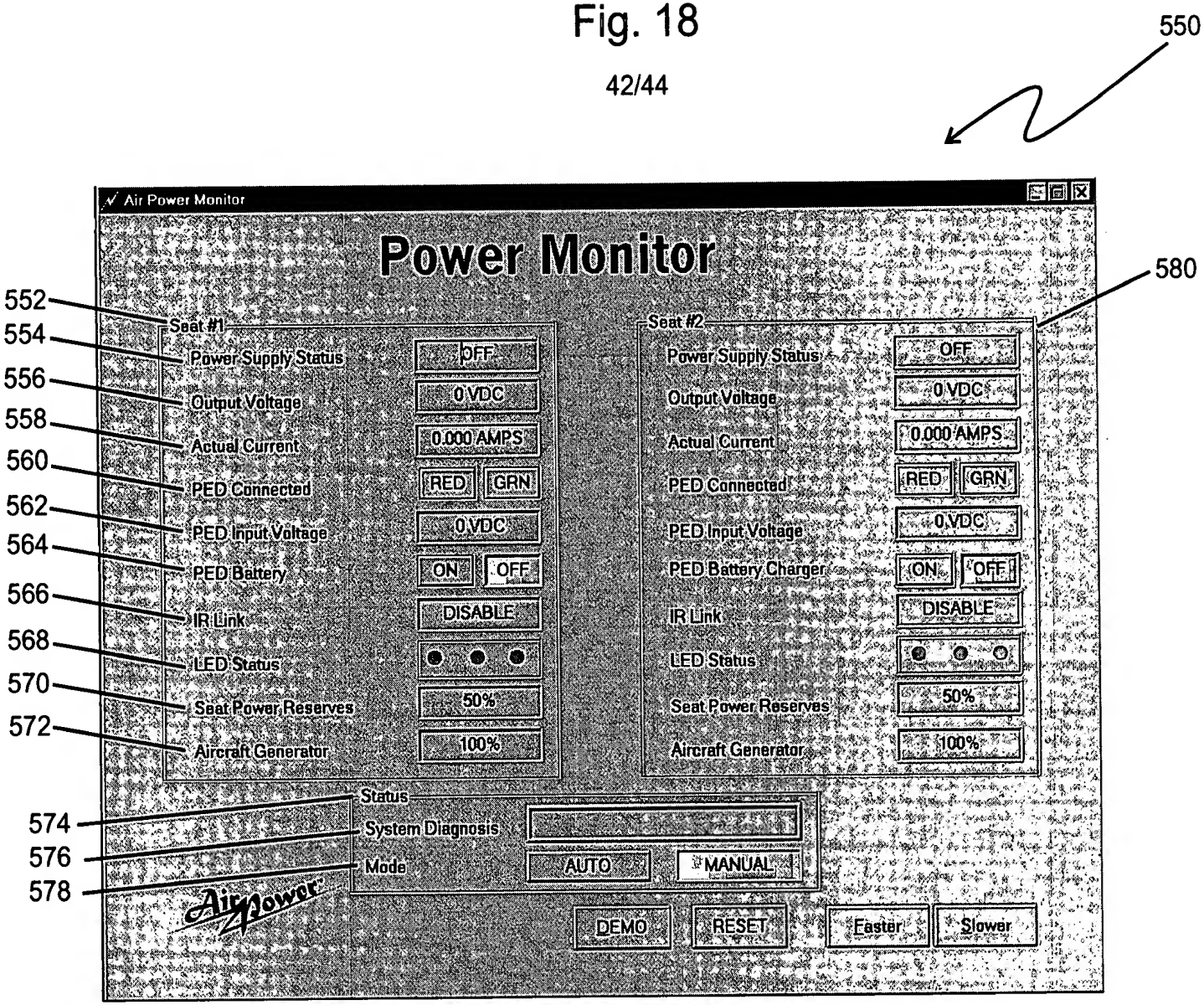
550
Air Power Monitor
Power Monitor
580
552
Seat #1
554
Power Supply Status
OFF
556
Output Voltage
0 VDC
558
Actual Current
0.000 AMPS
560
PED Connected
RED
GRN
562
PED Input Voltage
0 VDC
564
PED Battery
ON
OFF
566
IR Link
DISABLE
568
LED Status
570
Seat Power Reserves
50%
572
Aircraft Generator
100%
Seat #2
Power Supply Status
OFF
Output Voltage
0 VDC
Actual Current
0.000 AMPS
PED Connected
RED
GRN
PED Input Voltage
0 VDC
PED Battery Charger
ON
OFF
IR Link
DISABLE
LED Status
Seat Power Reserves
50%
Aircraft Generator
100%
Status
574
System Diagnosis
576
Mode
AUTO
MANUAL
578
AirPower
DEMO
RESET
Faster
Slower

Fig. 19

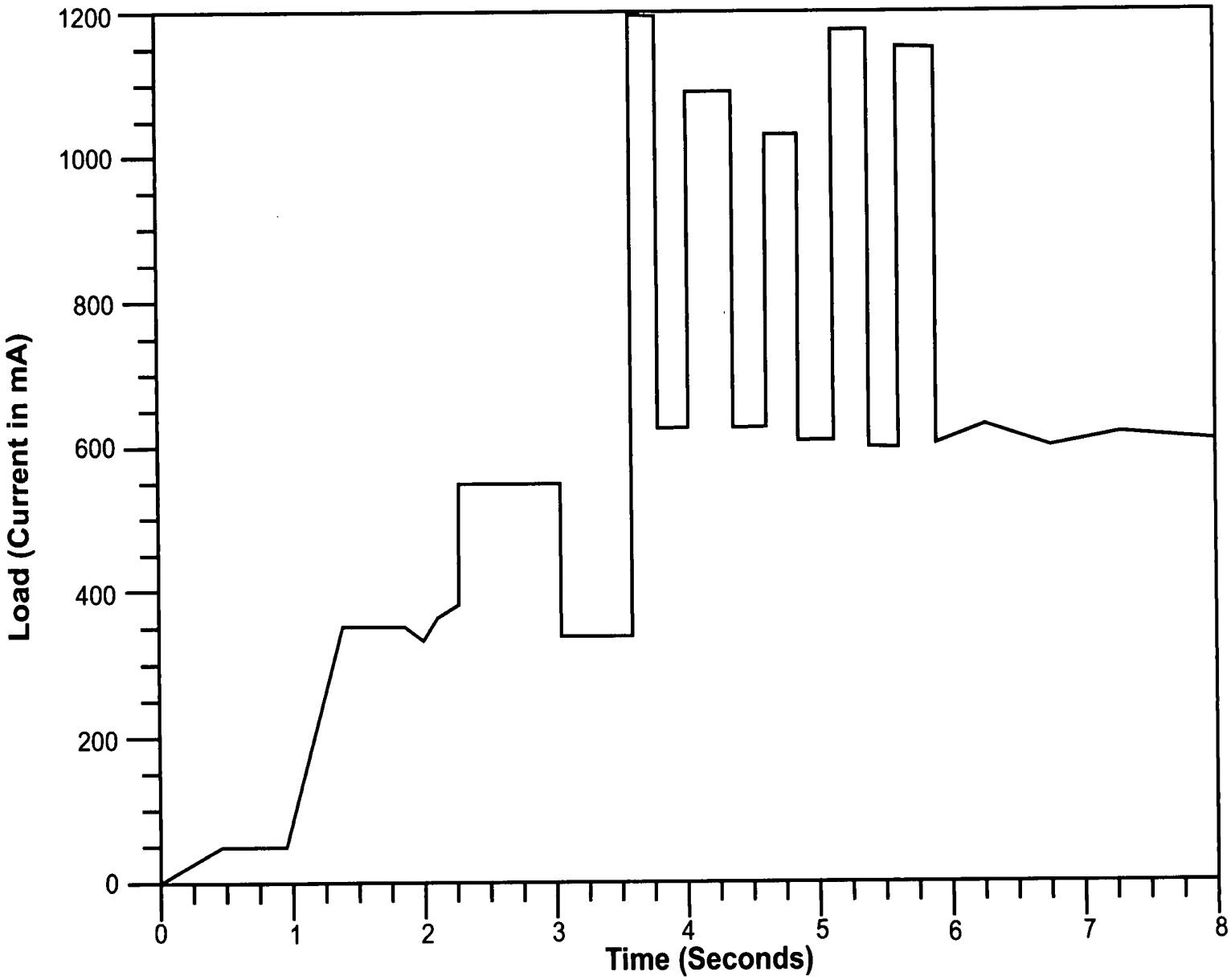

Fig. 20

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Look-up Table: Line Load (Resistive Values)		
Line Load (Ω Value)[1]	**Identifier**	**Hardware Description**
.20 Ohms	LL^0	No power cord (power receptacle empty)
.45 Ohms	LL^1	Power cord only (no connector attached)
.85 Ohms	LL^2	Power cord, with connector attached (connector cap is attached)
.60 Ohms	LL^3	Power cord, with connector attached (connector cap removed). Assembly is not inserted in battery pack.
$LL^4 = LL^3 + Variable^2$	LL^4	Power cord, with connector attached (connector cap removed). Assembly inserted in battery pack, but with GREEN Side #2 upward (correct insertion, but battery pack removed).
$LL^5 = LL^3 + Variable^3$	LL^5	Power cord, with connector attached (connector cap removed). Assembly inserted in battery pack, but with GREEN Side #2 upward (correct insertion, battery pack inserted in powered device). Powered Device is OFF.
LL^5 @ Vout	LL^6	Computed value of LL^5 @ Vout. Basis is LL^5 @ low voltage.
$LL^7 = LL^6 + Variable^4$	LL^7	Power cord, connector assembly inserted #2, with powered device's switch turned on (computed @ Vout).

Allowable error = 5%

---

[1] The Ohm values shown are not necessarily indicative of actual resistance readings of actual devices. Since resistive values of any element can be manipulated at the time of manufacture, it would be prudent to use resistors to rectify any deviation from a set target value.

[2] The added load of a removed battery pack cannot be determined as a real-time event, but can only be a pre-determined load, or range of loads.

[3] "Variable" is added load of powered device circuits between the battery pack and the ON/OFF switch.

[4] "Variable" is a detectable (and likely significant) increase in powerline load, as compared to known value LL^6.